

Albania: A Road Trip Through Time

ARCHAEOLOGY

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A publication of the Archaeological Institute of America

January/February 2018

TOP 10 DISCOVERIES OF THE YEAR

Birthplace of ZEUS

Ice Age Caribou Hunters

Divine Medicine in Ancient Cambodia

PLUS:
WWII Nuclear Saboteurs,
Viking Arts and Crafts,
Rose Gold Rush,
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COVER: Head of a bronze figurine identified as Zeus from Apollonia, Albania.
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EDITOR'S LETTER

HAPPY 70TH, ARCHAEOLOGY!

The authors have written, the Editor has edited, the printers have printed. As this page opens, a new magazine makes its bow. Those words launched the Spring 1948 premier issue of *ARCHAEOLOGY*, under the aegis of the Archaeological Institute of America, itself nearly 70 years old at that time. By its second issue, the magazine declared, "The editorial policy is settled that pictures need stories and stories need pictures....The Editors report with pleasure that the mature scholarship of our day is steadily producing more good things than they can print."



The tone of *ARCHAEOLOGY* was decidedly optimistic and forward-looking, even as the world recovered from the devastation of World War II and as signs of what would become the Cold War were already evident. In response, the editors aimed to bring fresh surveys of archaeological sites around the world to their readers. "More than ever," they wrote, "people are generally becoming over-absorbed in today's problems. *ARCHAEOLOGY* can perhaps...give the mind release from the tyranny of the present."

We who are now at the magazine these 70 years later—myself, executive editor Jarrett A. Lobell, deputy editor Eric A. Powell, senior editor Daniel Weiss, associate editor Marley Brown, editorial assistant Malin Banyasz, and our creative director Richard Bleiweiss—refer to past issues frequently and know that something important has been given into our hands. We are grateful to our loyal readers and hope, with every issue, to inform and entertain. In addition, we appreciate the trust that has been shown to the magazine's editors over the years by archaeologists around the world who willingly speak to us about their work. We thank them all.

And now, in this issue, as always, we ring in the new year with the "Top 10 Discoveries" (page 26). If you're wishing at this moment for a winter wonderland, then take a look at "Where the Ice Age Caribou Ranged" (page 34), by Jason Daley. "A View from the Birthplace of Zeus" (page 44), by contributing editor Jason Urbanus, brings us to Mount Lykaion and the earliest evidence for the worship of the Greeks' most powerful god. Jayavarman VII, king of the Khmer Empire in the twelfth and thirteenth centuries, was both compassionate and politically savvy, as associate editor Marley Brown writes in "Angkor Thom's Divine Medicine" (page 50). The story of the founding days of Christchurch is told in "New Zealand's First City, Uncovered" (page 38), by contributing editor Kate Ravilious. And lastly, "Letter from Albania" (page 54), by Matthew Brunwasser, follows the archaeological excavations necessitated by the construction of the Trans Adriatic Pipeline.

Claudia Valentino

Claudia Valentino
Editor in Chief

ARCHAEOLOGY

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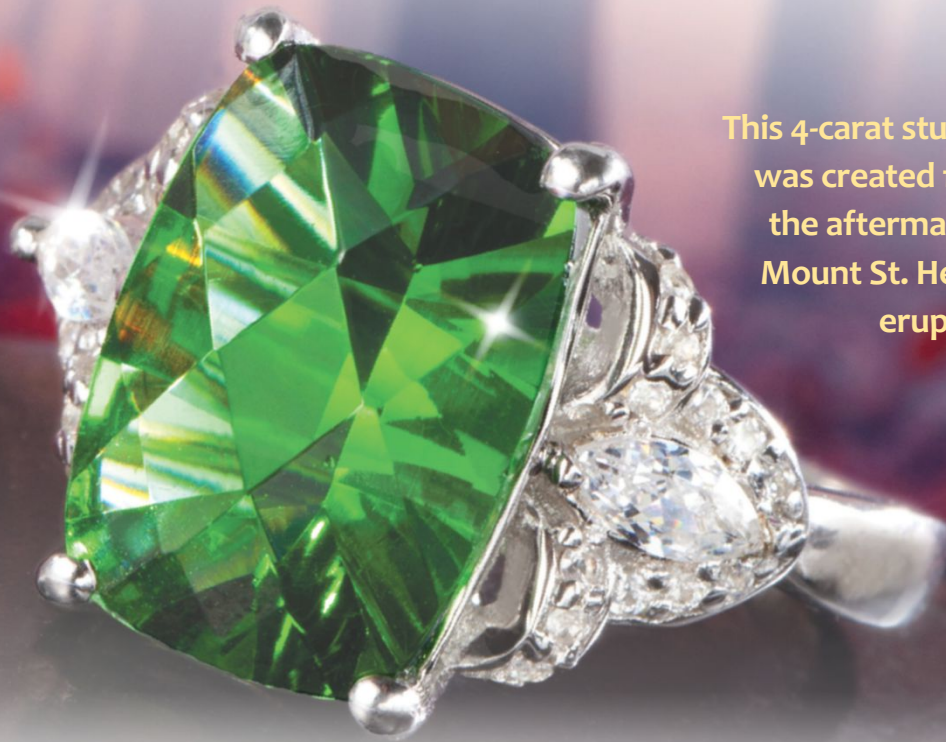
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PROTECTING OUR PAST

New acquaintances often react to learning that I am an archaeologist by asking, “What’s the best thing you ever found?” Underlying this innocent question is the assumption that archaeologists are treasure hunters—that we are searching for *something*. Nothing could be further from the truth. Archaeologists study human material culture to learn about the past. Human material culture is anything that people manufactured and left behind, such as pottery, coins, and buildings. Other types of finds from excavations are studied by specialists in related fields, for example, animal bones by zooarchaeologists, human physical remains by biological anthropologists, and ancient plant remains by paleobotanists.



The Dead Sea from Machaerus

Archaeologists excavate not to find *something* but to answer questions about the past based on remains we dig up in their original context. Therefore, searching for an object like Noah’s Ark or the Holy Grail is not the goal of a professional archaeologist. I began my current excavations at Huqoq because I wanted to determine whether the rise of Christianity adversely affected Jewish settlement in Galilee. (The answer: apparently not.)

Recently I returned from Jordan, where I was hosted by a Hungarian colleague named Győző Vörös who directs excavations at Machaerus, a fortified palace of King Herod the Great that overlooks the Dead Sea. It was at Machaerus that Herod’s son Antipas had John the Baptist beheaded. During one of our visits to the site, Győző pointed to several men illegally excavating on the hill opposite, which we had surveyed the previous day. Another carload of men shadowed us, waiting until we left to begin digging. The latter group, Győző informed me, was not impoverished locals but affluent individuals who had driven from Amman in their luxury car. The trunk was loaded with hoes and other digging equipment. Both groups, however, shared a common goal: to find gold. My heart broke as we climbed around the pockmarked slopes of Machaerus and the surrounding hillsides.

Looting rips archaeological artifacts from their context and destroys the associated remains. Like other countries in this region, the Hashemite Kingdom of Jordan lacks the means to police most of its archaeological sites and prevent illegal excavations. Many looted artifacts are sold on the antiquities market to collectors. One of the Archaeological Institute of America’s primary goals is to protect our shared cultural heritage through advocacy and education. My own hope is that by educating the public about the irreparable damage to archaeological sites caused by looting, we can reduce market demand and motivate populations around the world to recognize the value of protecting their local remains.

Jodi Magness

President, Archaeological Institute of America

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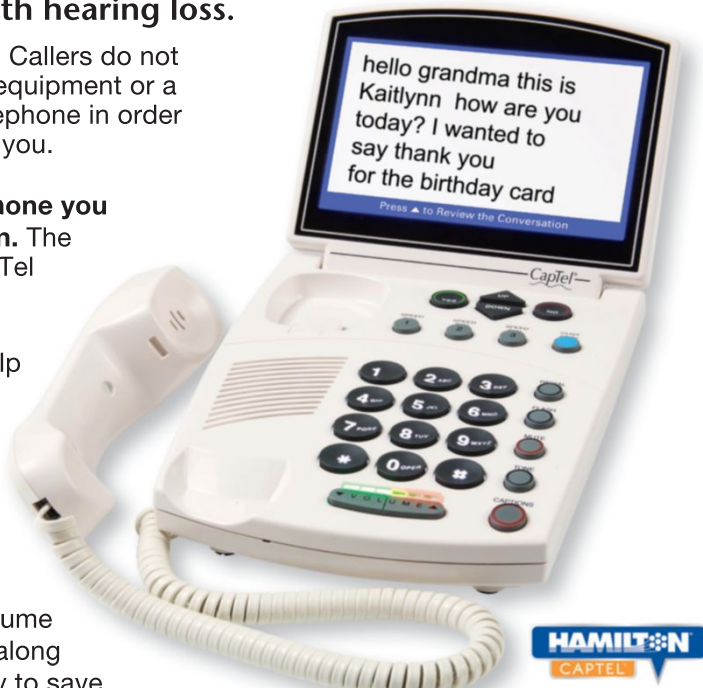
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FROM OUR READERS

FAMILY STORY

I was quite pleased to see Tuzigoot National Monument in “Off the Grid” (November/December 2017). I am very familiar with Tuzigoot because my father, Fred Peck, was a Park Service archaeologist there when I was born. He left the Park Service at that time, but continued as a seasonal ranger throughout my youth until we moved away from Clarkdale. Many of the dioramas at the visitor center were made by him and my mom in the 1950s. I hope they are still there. I have great memories of the monument and the Verde Valley. For anyone visiting the area, this is a site not to be missed.

Brian Peck
Raleigh, NC

MYTHS OF THE AMERICAS

The article “Reading The White Shaman Mural” (November/December 2017) and the work of Carolyn Boyd described in it are fantastic. Let me suggest another possible contextual parallel with Mesoamerican mythology. The peyote button interpretation of the

black dots seems valid, but they could, at the same time, also be a depiction of the Milky Way, which figures in the mythology of Mesoamerica in a couple of ways. In Aztec lore it is closely tied to Camaztli, the god of the hunt, whose name includes a reference to deer. This is very consistent with the layout of the mural. In Maya mythology, the Milky Way is also the path to the otherworld, or perhaps more accurately thought of as the path that is followed to return to the source of the day (i.e., the rising sun). Peyote-assisted vision quests may very well have had a tie-in to these elements of the mythology of the region, which would suggest an extraordinary unity of ideas in the mural.

Craig Dupler
Snohomish, WA

ARTISANAL HONEY

I enjoyed reading about the theory of nomadic practices among the Etruscan beekeepers in “Itinerant Etruscan Beekeepers” (November/December 2017). This specialization clearly indicates a market for a more exclusive product than that obtained from local flowering plants. A similar practice is maintained today in the swamps and rivers of the Florida Panhandle. Apiarists ship their hives aboard barges to access groves of the rare white tupelo tree. Its brief seasonal blooms provide a monofloral honey that is highly

prized for both its flavor and optimum fructose to glucose ratio.

Rob Cole
Panama City, FL

A FIRE PLAN

Regarding the fine article “The Ancient Ecology of Fire” (September/October 2017), here is another data point for you. In the late 1930s (I was born in 1929), the local southern California Indians were using the same land management techniques that you describe. Here is their version:

The Los Conejos Band of Indians lived on a reservation somewhere east of today’s El Capitan Reservoir. They depended on deer for a good part of their food supply, and when the grassland became overgrown with manzanita and coastal scrub, the deer moved out. The Indians had always managed this by burning until the BLM made that a crime. My parents had a ranch near Santee, California, and employed a cowboy part-time named Gil Strick. Gil knew the Indians, understood their problem, and helped them with the burning.

The BLM did not impose California hunting regulations on the Indians, so they hunted year-round. For helping them, the Indians gave Gil year-round hunting privileges, so during WWII, when meat was rationed, Gil would occasionally bring us a leg of venison.

Dan LeMay
Carlsbad, CA

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THE SECRETS OF SABOTAGE

One of history's greatest "what ifs" is the question of what would have happened had the Germans been able to develop nuclear weapons during the Second World War. The Wehrmacht's effort to do just that, called the *Uranverein*, or "Uranium Club," began in 1939 when German Army physicist Kurt Diebner began to research the potential military applications of nuclear fission. By year's end, the renowned German physicist Werner Heisenberg had expressed his belief that nuclear fission chain reactions, and thus, eventually, nuclear bombs, might be possible, but only if he had access to enough of a singular substance known as heavy water.

No facilities for manufacturing heavy water existed in Germany. But on April 9, 1940, the Germans invaded Norway, and in so doing acquired the Vemork Norsk Hydro Plant outside Rjukan, which, in 1934, had become the world's first commercial heavy water plant. Heavy water, or deuterium oxide, exists when the normal hydrogen atoms are replaced with the hydrogen isotope deuterium, which has both a neutron and proton in its nucleus, thus making it "heavier" than proton-only hydrogen. In nuclear fission reactions, whether in an atomic bomb or a nuclear power plant, heavy water is used to slow down and regulate the reaction. Once Germany controlled Norway, it controlled not only most of the world's existing supply of heavy water, but also Europe's only means of producing it. Soon, the Allies believed, Heisenberg would have all he needed to fuel his "uranium machine," and the *Uranverein* would be

well on the way to developing a nuclear bomb.

Fear of an atomic Germany was the driving force behind not only the race for the Allies to develop their own nuclear bomb capability—and thus the Manhattan Project—but also for their determination to destroy Vemork. Hence, the British Special Operations Executive (SOE), which was responsible for sabotage operations, initiated plans to cripple or obliterate the plant's heavy water production facility in November 1942.

After that attempt failed, the SOE conceived of Operation Gunnerside. For Gunnerside, Norwegian fighters trained in Scotland joined members of the earlier team who had remained in Norway. The operatives' approach to Vemork on the night of February 27, 1943, entailed climbing down—and then scaling—an icy 656-foot ravine. Upon entering the plant, the team went immediately to the heavy water room, placed their explosives, and exited the facility before the explosives detonated, destroying the heavy water produc-



Location of the former
Vemork Norsk Hydro Plant

FROM THE TRENCHES

tion capability, and also more than 100 gallons of the priceless liquid.

Operation Gunnerside has been called the most successful act of sabotage of World War II. But the actual heavy water room where it took place had not been documented or studied since Gunnerside. Norsk Hydro, which had ultimately resumed operations, ceased producing hydrogen and heavy water at the plant in 1971, and the abandoned factory was demolished six years later.

In September 2017, in anticipation of the seventy-fifth anniversary of Gunnerside, archaeologists Sindre Arnkvern and Line Grindkåsa of the Telemark



The heavy water room

County Council began a project to explore what might be left among the rubble. Several weeks after beginning their work, the team reached the basement, where, surprisingly, they found the heavy water room intact and in very good condition.

Joachim Rønneberg, Gunnerside's leader, is now 98 years old and is the only saboteur still alive. For many years, Arnkvern says, Rønneberg has wished for the plant to be excavated. "If we are fortunate enough to interview Mr. Rønneberg and to learn specifically where the events unfolded, that will be tremendous," he says. "Nothing can compare to the excitement of excavating something people will actually be able to walk into and of conveying the story of one of the most remarkable events of the Second World War."

— JARRETT A. LOBELL

For a 3-D walkthrough and more images go to archaeology.org/heavywater.

OFF THE GRID

SEVILLE HERITAGE PARK, SAINT ANN'S BAY, JAMAICA

Overlooking the Caribbean Sea, just outside the town of Saint Ann's Bay on Jamaica's north shore, Seville Heritage Park encompasses thousands of years of the island's history. The 300-acre property has been settled during every period of Jamaica's human occupation. It contains the remains of Maima, an indigenous Taino village that Christopher Columbus encountered upon first landing in Jamaica in 1494. In 1509 the Spanish founded their first colonial capital there, which they called Sevilla la Nueva, before abandoning it in 1534. England invaded Jamaica and wrested control from Spain in 1655. As a reward for service to the army during that campaign, English captain Richard Heming was given the land. In 1670, he established a sugar plantation that, until emancipation in 1838, was home to an average of 275 enslaved African Jamaicans in any given year. The majority of that community lived in a village behind the eighteenth-century "Great House," the planter's residence built in 1745 by Heming's grandson. The house still stands and is now a museum that tells Seville's story. Claudette Anderson, Jamaica National Heritage Trust operations manager, explains that Seville can be seen as the birthplace of modern Jamaica, a spot where the nation's identity was forged. "We interpret the lives of people from four cultures," she says. "The Taino, African people, the British, and the Spanish: They all make up who we are as Jamaicans today."

THE SITE

The Great House now hosts Seville's museum, and has an exhibit covering Jamaica's history from the earliest evidence of human presence in the area, about A.D. 650, to the beginning of the twentieth century. A guid-

ed tour includes a visit to reconstructions of both the Taino and the enslaved African villages, and remnants of the plantation, such as a massive water wheel used to pulp sugarcane. Though Seville doesn't currently offer a tour of the remains of the Spanish

capital, which include the ruins of the governor's mansion and a sixteenth-century church, the staff tries to accommodate groups of interested travelers who call ahead.

WHILE YOU'RE THERE

Begin your visit in Seville's Great House,



Slave hut

which gives you a historical overview of the site and displays artifacts uncovered by archaeologists. From there, take advantage of a guided tour or a tour of the property on horseback. About a 20-minute drive west, travelers can also visit the Green Grotto Caves, a complex thought to have been used for shelter throughout the centuries by native Tainos, escaped slaves, and smugglers.

—MARLEY BROWN



Great House

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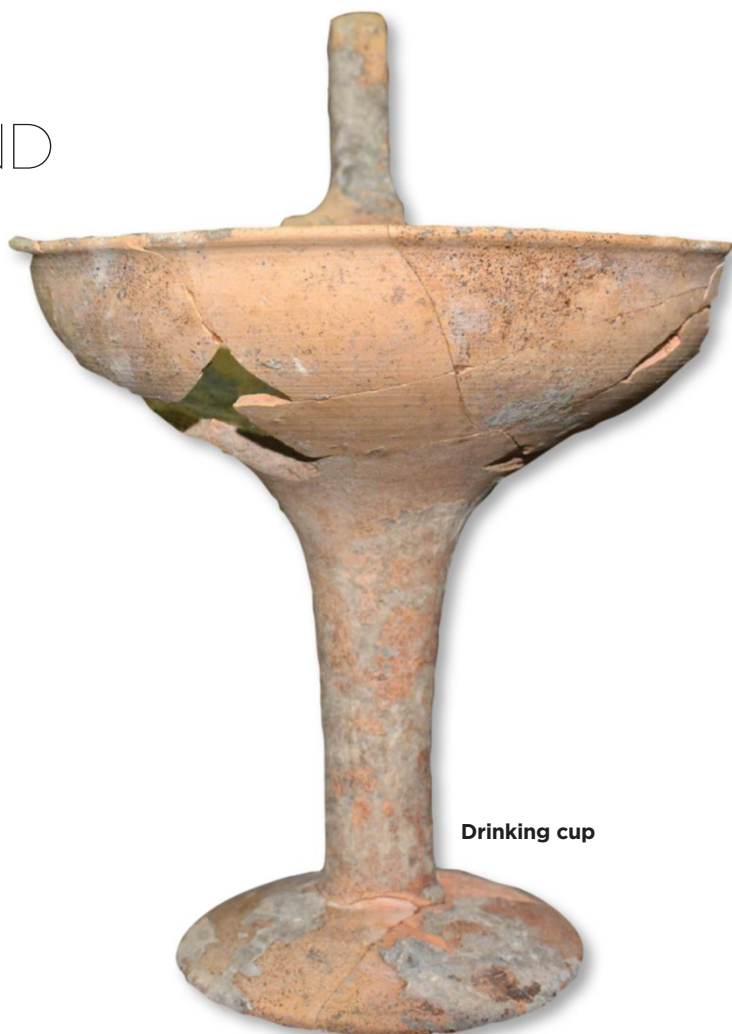
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A MONUMENTAL FIND



Chamber tomb facade, Prosilio, Greece



Drinking cup

A monumental rock-cut chamber tomb has been excavated in central Greece near the ancient city of Orchomenos, the most important regional center during the Mycenaean period. In a cemetery of similar structures, this tomb is distinguished by its size—at 452 square feet, it is the ninth largest of the more than 4,000 Mycenaean chamber tombs excavated over the last 150 years, says University of Cambridge archaeologist Yannis Galanakis. It is even more notable for its contents, which include the remains of one man and a substantial amount of jewelry. “Mycenaean rock-cut chamber tombs were used for multiple burials, so to find only one burial is extraordinary,” says Galanakis. The artifacts have also surprised scholars. “There is very little



Horse bridle bits

painted pottery, which is always found in contemporary tombs,” explains Galanakis. “But there is a lot of jewelry, which previously has been ascribed to female burials. Now we can ask why certain objects were selected while others weren’t.”

— JARRETT A. LOBELL

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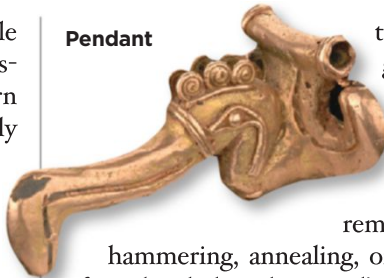
THE PINK STANDARD

Gold is generally thought to have been prized by people throughout human history, and researchers have discovered that the Nahuange, who lived in northern Colombia during the first millennium A.D., intentionally treated gold jewelry to turn it a pinkish orange. Marcos Martínón-Torres of University College London and Juanita Sáenz-Samper of the Museum of Gold in Colombia analyzed 44 Nahuange artifacts in the museum's collection

Belt



Pendant



that were made from *tumbaga*, a gold alloy containing a substantial amount of copper.

All the objects were initially subjected to “depletion gilding,” in which copper is removed from the surface through

hammering, annealing, or both, producing a golden surface that belies the metal’s true contents. This gilding was later deliberately removed, bringing out the copper’s pinkish tones. “We suggest that at a particular moment, it was desirable for an object to be golden, and

at a later point, it was desirable to have the gilding removed,” says Martínón-Torres. He adds that red has been associated with the feminine

Nose ornament (front)



Nose ornament (back)



in the region, so objects may have been turned pink when a woman took ownership of them or when a female owner entered puberty.

— DANIEL WEISS

HOT PROPERTY

Archaeologists working with aerial and satellite technology have discovered nearly 400 stone structures in a sparsely populated region of Saudi Arabia called Harrat Khaybar, dominated by now-inactive lava mounds. They estimate that the structures, which they call gates, date to the Middle Neolithic period, roughly 7,000 years ago. David Kennedy of the University of Western Australia explains that while the landscape now appears forbidding, the area has supported human com-



munities in periods between eruptions. “The most recent eruption, as visible from the lava flow, was quite limited in its direct impact,” he says. “People lived there before recent times.” Kennedy has not been able to determine the function of the structures from satellite images alone. “I usually look for a simple solution,” he says. “In this case I would prefer an explanation related to everyday concerns such as food and water.”

— MARLEY BROWN

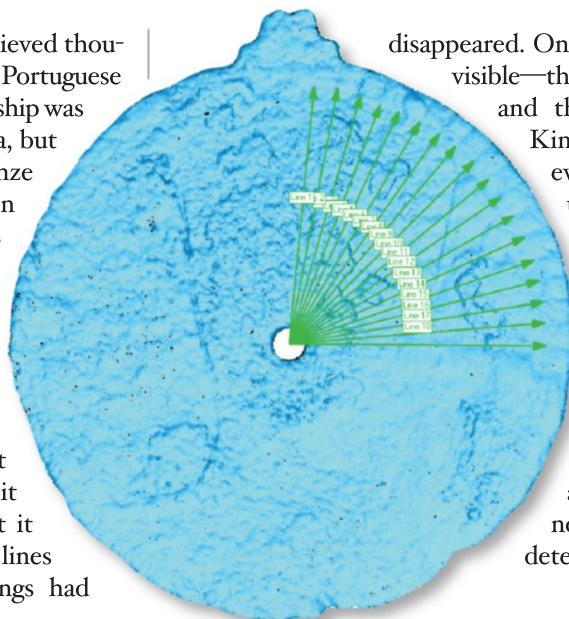
SPOTTING THE SUN

Over the past several years, divers have retrieved thousands of objects from the wreck site of the Portuguese ship *Esmeralda* off the coast of Oman. The ship was originally part of an armada led by Vasco de Gama, but sank in a storm in 1503. One of the artifacts, a bronze disc measuring around seven

Astrolabe



inches in diameter, was recently confirmed to be a rare astrolabe, a type of navigational instrument. When the object was first brought to the surface it was unclear what it might be, since all lines and nautical markings had



disappeared. Only two symbols remained visible—the Portuguese coat of arms and the personal emblem of King Dom Manuel I. However, 3-D laser scanning undertaken by the University of Warwick revealed 18 etched lines radiating from the disc's center, each separated by five-degree increments. Sailors used these markings to measure the sun's height above the horizon at noon, which helped them determine their location.

—JASON URBANUS

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FROM THE TRENCHES

BRONZE BEAUTY

The ship that sank in 65 B.C. off the coast of the Greek island of Antikythera and that once held the famous mechanism that ancient Greeks used to plot the motion of celestial bodies has yielded intriguing new discoveries thanks to a customized metal detector put to use in the 2017 field season. The team turned up a bronze plate decorated with a bull, and an arm from a previously unknown bronze statue, which

joins seven to nine other statues previously found at the underwater site. According to the project's codirector Brendan Foley of Lund University in Sweden, who is working in cooperation with Angeliki Simosi, director of the Ephorate of Underwater Antiquities, the new finds hint that there may be even more ancient Greek artwork lying beneath the sand.

— ZACH ZORICH



Shipwreck, Antikythera, Greece



Bronze plate



Bronze statue fragment

MASKED MAN

While tunneling beneath a ceremonial platform in the palace complex of the ancient Maya site of Waka', a team of archaeologists led by David Freidel of Washington University in St. Louis uncovered the tomb of one of the city's early rulers. The burial chamber contained a set of ceramic cups and a spouted vessel that may have been used to serve a powerful

hallucinogenic drink. Pottery styles suggest that the grave dates to between A.D. 300 and 350. Archaeologists also found a small jade mask covered with cinnabar, a bright red pigment, with the skeleton. The mask may have been worn on a belt as an ornament that



Jade mask

portrayed a royal ancestor. A rectangular symbol on the mask's forehead seems to link the ruler to the Kaanul kingdom, a powerful nation that fought for centuries against the kingdom of Tikal, just 45 miles away from Waka'.

— ZACH ZORICH

QUEEN OF THE OLD KINGDOM

Queen Ankhnespepy II was among the most powerful female leaders of Egypt's Old Kingdom. She was married to two kings of the Sixth Dynasty—Pepy I and Merenre—and served as regent when her son Pepy II became king at the age of six. New discoveries by the Swiss-French archaeological mission at the Saqqara necropolis are providing further evidence of her importance. The team has found what appear to be the top portions of the two obelisks that would have stood at the entrance to the queen's funerary temple. Both measure 3.5 feet on a side, and the larger is around eight feet tall, making it the largest Old Kingdom obelisk fragment yet discovered and indicating that the full obelisk would have stood more than 16 feet tall. Notably, the obelisks were made of granite, which was usually reserved for kings.

The team, led by Philippe Collombert of the University of Geneva, also found a wooden statue head whose stylistic features—thin cheeks, large circular earrings—suggest it dates to the New Kingdom, though there are no wealthy graves from that period in the area. There is a very slight chance the head could represent Queen Ankhnespepy II, says Collombert. Radiocarbon dating will, he hopes, help find the answer.

— DANIEL WEISS

Wooden
statue
head



Obelisk fragment,
Saqqara, Egypt



Excavation of second
obelisk fragment

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FROM THE TRENCHES

UNDERGROUND PARTY

A villager in the northern Chinese province of Shanxi was renovating a house when he was shocked to discover it was built over an ancient tomb. Archaeologists called in to excavate the site dated it to the Song Dynasty (A.D. 960–1127) and found that the burial chamber had been decorated with tile carvings depicting horses and flying deer, as well as an elaborate fresco of a lavish family feast. “It’s a glimpse of real life during the Song Dynasty,” says Zhong Longgang of the Shanxi Provincial Institute of Archaeology, who supervised the dig. “We think the party fresco depicts the people who were actually buried in the tomb, and it gives us a look at the clothing, diet, and etiquette of the period.” Many of the tiles recovered from the tomb have impressions of palm prints, which may have served as the signatures of the artisans who made them.

— ERIC A. POWELL



Tomb, Shanxi, China



Tiles from the tomb



Assyrian city, Iraq



Cuneiform tablets

ASSYRIAN ARCHIVISTS

Archaeologists excavating a Bronze Age Assyrian city in Iraqi Kurdistan have unearthed a cache of almost 100 cuneiform tablets. Led by the University of Tübingen’s Peter Pfälzner, the team discovered the archive under the remains of a large public building that had been deliberately destroyed in antiquity, most likely during an enemy attack. Dating to about 1250 B.C., most of the tablets were in a ceramic pot that had been buried in a thick layer of clay, probably after the city was sacked. “We think the tablets were originally stored in that building, and that they remained in their original position after the structure was destroyed,” says Pfälzner. “They could have protected them somewhere else, so there must have been some importance behind keeping the archive there.” Most of the tablets are badly worn and have not yet been deciphered, but one fragment that has been translated mentions the temple of Gula, a Mesopotamian goddess of healing, a hint that the building may have been that deity’s sanctuary.

— ERIC A. POWELL

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FROM THE TRENCHES



UNKNOWN ELITES

Gabriel Prieto originally planned to excavate next to a church in Huanchaco, on Peru's north coast. Three days before he was to begin, he was notified that it was no longer possible—Pope Francis would be visiting in January 2018 and preparations needed to be made. After first digging in the middle of a street, where he found mostly looted burials, eventually Prieto secured a new site in a nearby schoolyard. There, in layers undisturbed by either looters or modern activity, he excavated a cemetery more than 10 feet deep in which he found evidence of some of the least-known periods of ancient Peruvian history. "This unplanned discovery proved to be the best discovery I have made in the last five years," says Prieto.

Some burials date to the Gallinazo or Viru period (200 B.C.–A.D. 550), a time when locals competed with the Moche for territory and resources, explains Prieto. The richest deposits date to the Salinar period (400–200 B.C.). These contain gold artifacts, ritual paraphernalia, and a stone mace head, as well as skeletons exhibiting severe injuries. "Salinar was a period of violence and social conflict," says Prieto, "but this unusual concentration of high-status burials suggests that even at fishing settlements like Huanchaco, social differentiation was evident."

— JARRETT A. LOBELL



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Cinnabar-covered stone emblem



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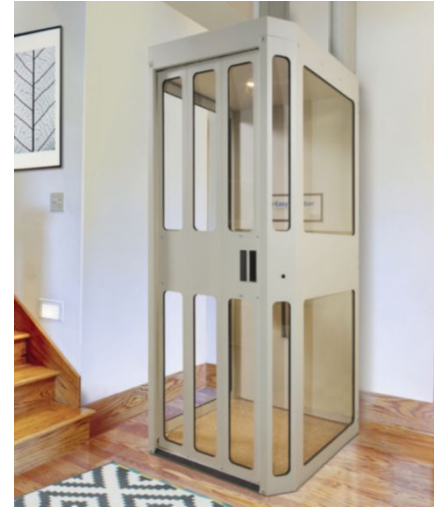
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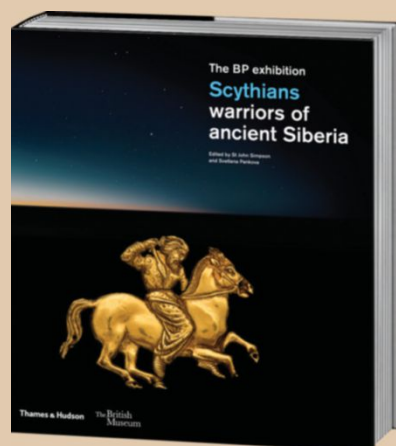
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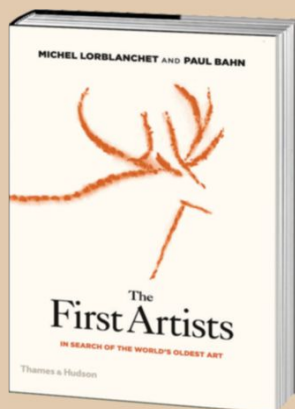
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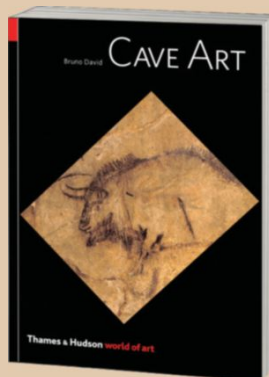
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FROM THE TRENCHES

FRONT ROW SEATS

Excavations at the Western Wall in Jerusalem led by Joe Uziel and Avi Solomon of the Israel Antiquities Authority have uncovered a Roman-era building that may have been used to host performances or political assemblies. The building may date to the mid-second century A.D. when the emperor Hadrian was having the city rebuilt after the Roman army destroyed it and the Second Temple in A.D. 70. The newly discovered building probably seated about 200 people and was located under what is now called Wilson's Arch, after the nineteenth-century explorer who identified it. The arch was part of a causeway that led into the temple and may have had acoustic properties that made it an attractive location for public speaking or singing.

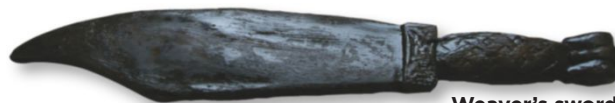


Roman theater,
Jerusalem, Israel

— ZACH ZORICH

IRISH VIKINGS

Recent excavations in Cork, Ireland, conducted ahead of construction at the former Beamish and Crawford Brewery in the city's historic center have uncovered the remains of 19 eleventh- and twelfth-century Viking houses and more than 50 wooden artifacts. The objects, found among the house foundations, are carved in Ireland's Viking Age Ringerike style, a fusion of Norse and native Irish cultural elements. They include a 12-inch-long weaver's "sword" used for hammering threads and making patterns on textiles woven on a loom, as well as a decorated wooden thread winder. According to Maurice Hurley, lead archaeologist on the project, a



Weaver's sword



Viking houses, Cork, Ireland

roughly 1,000-square-foot section of the site revealed nearly 100 years' worth of Viking-style house-building on the same lot, exposing the Scandinavian influence at the city's core. "The Norse origins of Dublin and Waterford are better attested and better proved archaeologically than those of Cork to date," Hurley explains. "But now I think we have a much stronger body of evidence showing that the cultural sphere of all three cities is very similar."

— MARLEY BROWN

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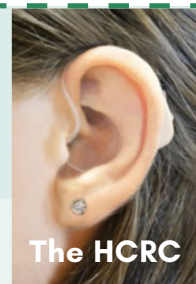


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CANADA: Nearly 60 years after it disappeared, one of the models of Canada's most legendary jet fighter, the Avro Arrow, has been

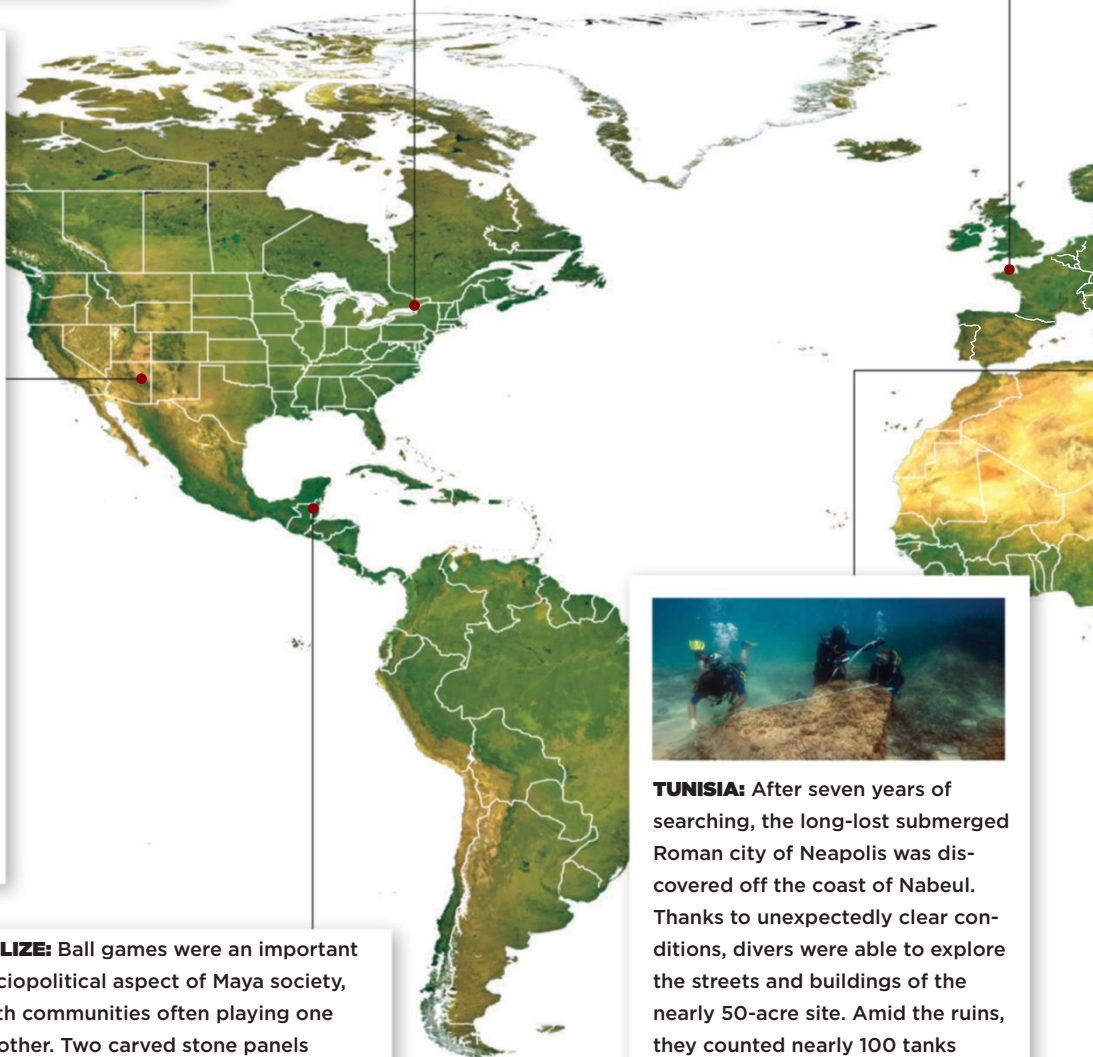
discovered by an ROV in Lake Ontario. The technologically advanced plane was developed in the 1950s, but the program was suddenly scrapped in 1959, and all existing aircraft and blueprints were destroyed. The 12-foot-long, 10-foot-wide, small-scale test model had been launched over the lake to determine its flight worthiness and improve the Arrow's final design.



GUERNSEY: Archaeologists are baffled by a 14th-century burial on Chapelle Dom Hue, a small islet once used as a monastic retreat. Because the grave was so well constructed, researchers initially believed it belonged to a human and were shocked when they encountered the bones of a porpoise. Although these marine mammals were eaten during medieval times, it is not known why the remains were buried in such a careful matter, suggesting perhaps that the porpoise had some kind of religious significance.



ARIZONA: Canyon Creek in eastern Arizona was one of the turquoise sources exploited by pre-Columbian indigenous groups, but it has long been considered insignificant. A new study of the area, however, has shown that the mines were actually a major supplier of the bluish-green mineral during the 13th and 14th centuries, when turquoise was exported to sites as far as 80 miles away. Lead isotope analysis of samples indicates that Canyon Creek turquoise is unique, making it distinguishable from other sources in the Southwest.



TUNISIA: After seven years of searching, the long-lost submerged Roman city of Neapolis was discovered off the coast of Nabeul. Thanks to unexpectedly clear conditions, divers were able to explore the streets and buildings of the nearly 50-acre site. Amid the ruins, they counted nearly 100 tanks used to produce garum, a popular Roman fermented fish sauce of the time. Neapolis was partially destroyed by a tsunami in A.D. 365, an event recorded by the Roman historian Ammianus Marcellinus.



BELIZE: Ball games were an important sociopolitical aspect of Maya society, with communities often playing one another. Two carved stone panels depicting ballplayers from the site of

Tipan Chen Uitz seem to commemorate one famous competition that occurred there between A.D. 600 and 800. One of the players stands beside a large ball, wears a protective belt, and holds a staff-like object in his hand. The hieroglyphic inscription identifies him as "Waterscroll Ocelot." He most likely competed for the home team.



GERMANY: One of Europe's oldest battlefields is located in northeast Germany's Tollense River Valley. Around 3,250 years ago, a clash involving some 2,000 warriors left a mile-long stretch of the river littered with weapons and dead bodies. Recent isotopic analysis of tooth enamel was able to narrow down the geographic origins of the combatants. While one group was local to the region, scientists determined that a second group was made up of diverse individuals who had traveled from southern Germany or central Europe to join the battle.



SWEDEN: Several valuable objects unearthed at the Sandby Borg ringfort on the island of Öland may finally provide more clues about a massacre that occurred there 1,500 years ago. Several of the settlement's inhabitants, including children, were slaughtered in the 5th century, but it is not known why. The recent discovery of a Roman gold coin, two gold rings, and Roman glass indicates that the islanders maintained close ties with the empire and were quite wealthy, which may have fostered resentment among rival communities.



CRETE: The Anavlochos massif in east central Crete had important religious significance for communities living around it thousands of years ago. Two

areas with large deposits of votive material were recently uncovered near the summit. One of the deposits contained over 350 female figurines that were purposefully deposited in cracks in the bedrock throughout the first millennium B.C. Experts are still unsure why this particular spot was chosen, but they believe the statuettes were offerings left by women during religious festivals.



ISRAEL: A unique 7,000-year-old ceramic vessel from the site of Tel Tsaf in the Jordan Valley may have been used in early food rituals associated with grain storage.

The site contains numerous silos that are believed to be the oldest large-scale storage containers that existed in the region at the time. Experts think the unusual pot, which is topped with red-painted clay balls and resembles a miniature silo, was used during ceremonies that preceded the placement or removal of grain.



RWANDA: Excavations have begun at a palace built by King Kigeli IV Rwabugiri in 1874. The royal residence, situated near the shore of Lake Kivu in Western Province, was often frequented by the king as he hosted feasts and celebrations. Archaeologists are hoping to learn more about the physical layout of the complex and gain insight into the activities that occurred there, as part of an effort to collect and preserve more of Rwanda's cultural heritage.

A photograph of an archaeological excavation site at dusk. The foreground is filled with large, rectangular stone blocks and rubble, some of which are part of a larger structure. In the background, a wooden walkway or scaffolding structure is visible, leading towards a body of water under a dark, cloudy sky. The lighting is warm and golden, highlighting the textures of the stone and the silhouettes of the structures.

TOP 10 DISCOVERIES OF 2017

ARCHAEOLOGY's editors reveal the
year's most compelling finds



SKULL CULT AT GÖBEKLI TEPE

Sanliurfa, Turkey

Göbekli Tepe is one of the world's most significant, yet mysterious, archaeological sites. Between the tenth and eighth millennia B.C., people there erected a series of massive stone circles where groups gathered for religious or social purposes. This year, researchers revealed that microscopic analysis of bone fragments found at the site suggests that human skulls may once have hung there on prominent display. The fragments belong to three partially preserved skulls that were carved and altered after death. This is the first indication of how Göbekli Tepe's inhabitants may have treated their dead, and archaeologists believe it may provide evidence of an Early Neolithic "skull cult" that exhibited the decapitated heads of either venerated ancestors or dispatched enemies at designated spots.

The discovery further underscores the complex

ritual behavior exhibited at Göbekli Tepe. Marks on the three partial skulls indicate that they were de-fleshed, modified, and even painted. Deep incisions were repeatedly carved into the skulls with stone tools to create grooves that ran up the forehead and toward the back of the head. According to researcher Julia Gresky of the German Archaeological Institute, the skulls may have been suspended by a cord that wrapped around the head and passed through a small drill hole at the top. The incised grooves would have prevented the cord from slipping along the smooth surface of the bone as it dangled. "The three modified skulls attest to the special treatment of certain individuals and represent an entirely new category of find," she says, "one which testifies to the interaction of the living with the dead at this important Early Neolithic ritual center."

— JASON URBANUS

Researchers at the Neolithic ritual center of Göbekli Tepe in Turkey have discovered this fragment of a human skull (inset), one of three that were carved and altered after death, and possibly put on public display.



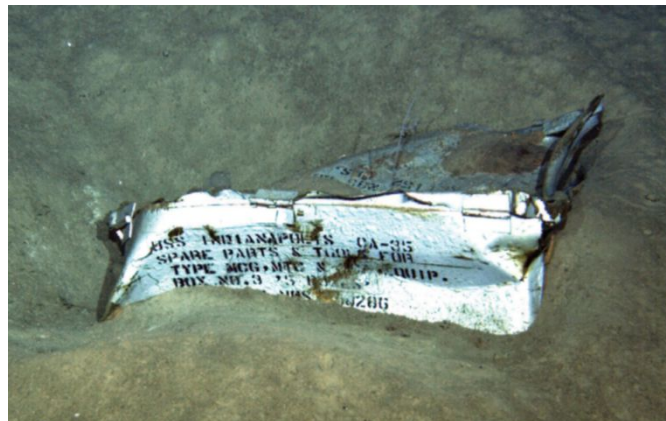
FINDING INDIANAPOLIS

North Pacific Ocean

The sinking of USS *Indianapolis* is ranked as one of the greatest disasters in U.S. naval history. The much-decorated Portland-class heavy cruiser left San Francisco on July 16, 1945, with 1,196 crewmen aboard. Her final mission, as she raced to the naval base on the North Pacific island of Tinian, was to deliver components of “Little Boy,” the atomic bomb dropped on Hiroshima. Mission completed, the ship set out along a prescribed course only to be hit by torpedoes fired from a Japanese submarine on July 30. *Indianapolis* began to sink within a mere 12 to 15 minutes. Three and a half days passed before aircraft spotted survivors. The wreck of *Indianapolis* was lost for 72 years. Now, it has been found, some 18,000 feet under the North Pacific.

Because no distress call was received and her deck logs did not survive, the official Navy record of the ship’s location when she sank relied primarily on the testimony of her surviving captain, who confirmed that he had followed his assigned route from Tinian to the Philippines. By comparing this route with the position of *LST-779*, a tank-landing ship newly identified as having been the last known vessel to have had visual contact with the cruiser, 11 hours before she sank, naval historian Richard Hulver and archaeologist Robert Neyland suggested a new position for the wreckage of *Indianapolis*. Though there have been efforts to locate her before, “No one thought they would ever see *Indianapolis* again,” says Hulver. “But I was hopeful.” Using an autonomous undersea vehicle able to scan the remotest depths of the seafloor, a research team located the ship. Until now, *Indianapolis*’ 316 survivors, 18 of whom are still living, had provided the only evidence of her triumphs and tragedies.

—JARRETT A. LOBELL



A spare parts box (above) found on the Pacific floor displays the name USS *Indianapolis*. The heavy cruiser was photographed (below) on July 10, 1945, just six days before she embarked on her final mission.



SUPER FRUITCAKE

Cape Adare, Antarctica

The discovery of a 106-year-old fruitcake on Antarctica's Cape Adare may help redeem the delicacy's much-maligned reputation. The centenarian cake was found by a team from the



Antarctic Heritage Trust in the continent's oldest building, a hut erected in 1899, and is thought to have been left there in 1911 by members of the Northern Party, part of British explorer Robert Falcon Scott's Terra Nova expedition. The tin holding the Huntley & Palmers fruitcake was somewhat rusty, but the cake itself was in fine



shape—likely due to the cold, dry conditions. “It felt and looked like a new fruitcake,” says Lizzie Meek, the trust's program manager. “It was only if you got quite close to it that you could smell that slightly off smell of butter that's gone wrong.”

— DANIEL WEISS

A nearly edible Huntley & Palmers fruitcake (above) has been discovered in a hut (far left) on Antarctica's Cape Adare. It is thought to have been left behind in 1911 by members of a British expedition.

AZTEC WARRIOR WOLF

Mexico City, Mexico



The adorned skeleton of a wolf, including its skull (top left corner), has been discovered in a burial in Mexico City. Gold artifacts placed with it appear to have been intended to treat the wolf as if it were a human warrior.

Archaeologists excavating at the foot of the Aztecs' Great Temple, in downtown Mexico City, discovered a dazzling collection of gold artifacts and the skeleton of a juvenile wolf. Occupying a stone box the size of a dishwasher, the gold artifacts are the finest yet excavated at the 40-year-old dig, says lead archaeologist Leonardo López Luján. They include ear and nose ornaments and a piece of body armor known as a pectoral—glittering, stylized versions of attire that were used to decorate the sacrificed wolf, as if the canine were symbolizing a human warrior. The wolf's head faced west, signaling that it was “the companion of the sun, after the sunset, during its journey to the underworld,” says López Luján. The offering was buried during the reign of Ahuitzotl (1486–1502), a time of war and great imperial expansion for the Aztecs.

— ROGER ATWOOD



DAWN OF EGYPTIAN WRITING

El-Khawy, Egypt

Archaeologists have discovered an oversized inscription that offers a new glimpse into the early development of the Egyptian writing system. A team led by Yale University Egyptologist John Darnell found the hieroglyphs on a cliff face within view of a desert road north of the ancient city of Elkab. Dating to around 3250 B.C., they were carved during Dynasty 0, a period when the Nile Valley was divided into competing kingdoms and scribes were just beginning to master writing. Previously discov-

ered Dynasty 0 inscriptions are less than an inch in height and are largely confined to arcane administrative matters, but the newly discovered inscription is 27 inches tall, and is the earliest known set of large-scale, highly visible hieroglyphs by some 300 years.

The inscription's symbols—a bull's head on a pole, followed by two storks and an ibis—are similar to those used in later Egyptian writing to equate a pharaoh's authority with control over the cosmos. That led Darnell to conclude that the inscription was a royal boundary marker that asserted a king's dominion over the area. "It was like a signpost," says Darnell. "Travelers along that road would have known they were entering an area under official authority." In addition, he believes the discovery suggests that Egyptian writing developed at a quicker pace than previously thought, and was being used to publicly project royal power at a very early date.

—ERIC A. POWELL



Newly discovered, the earliest known public Egyptian hieroglyphic inscription contains four symbols (right to left): a bull's head mounted on a pole, followed by two storks flanking an ibis. It is believed to be royal messaging.



CAVEMAN GENETICS

Eurasia

Remains of early humans such as Neanderthals and Denisovans have been discovered at just a limited number of sites in Europe and Asia. This has long frustrated archaeologists, who are confident that many more locations were occupied throughout these regions. This year, however, researchers announced a new way of detecting the hominins' presence—through genetic traces in cave sediments. A team led by Viviane Slon of the Max Planck Institute for Evolutionary Anthropology analyzed sediments from seven sites in France, Belgium, Spain, Croatia, and Russia, and found Neanderthal DNA at three sites dating to up to 60,000 years ago, and Neanderthal and Denisovan DNA in Russia's Denisova Cave dating to around 100,000 years ago. In a number of cases, the genetic evidence was located at stratigraphic levels where no hominin remains have been found. "It was really exciting," says Slon, "to see that even without the bones, we can still find the DNA of these people."

The technique worked even with sediments that had been collected a number of years ago and stored in labs, Slon notes, "so we're not only restricted to active excavations." The researchers hypothesize that the DNA in the sediments comes from body fluids left behind by hominins as well as decomposition of their remains. So far, they have focused on mitochondrial DNA, but hope to be able to find nuclear DNA as well, which would provide additional genetic information about the hominins.

—DANIEL WEISS



Hominin DNA was detected at four archaeological sites in Europe and Asia, including (above) Russia's Denisova Cave. Researchers have, in some cases, located DNA at levels where no hominin remains were previously found.



IRON AGE BRITAIN'S OLDEST GOLD

Staffordshire, England

Four torcs uncovered in Leekfrith are the earliest Iron Age gold items ever found in Britain. They can be dated to between 400 and 250 B.C. based on their stylistic qualities, says Julia Farley of the British Museum, who notes they were most likely worn by women. The torcs' age is remarkable because, for several hundred years starting around 800 B.C., people in Britain appear to have largely abandoned wearing

and manufacturing gold jewelry. One explanation is that the trade networks that brought gold to England had broken down. Tin and copper, used to make bronze, which had been key imports, were no longer needed once locally produced iron became available. Societies became focused on community survival rather than individual status. "Communal identity might have been more important than things which

emphasize an individual's power, like wearing loads of bling," Farley explains. She believes the torcs were likely made on the continent and show that personal adornment was coming back into vogue as Europe grew cosmopolitan again. "The simplest explanation," Farley says, "is that they came across the channel as gifts or trade goods, or perhaps the women even came over wearing them."

— MARLEY BROWN



Four torcs found in Leekfrith, Staffordshire, in England, are the oldest examples of British Iron Age gold. The smallest torc was likely worn around the forearm, the others around the neck.



ROME'S OLDEST AQUEDUCT

Rome, Italy

Construction workers on Rome's new "C" metro line uncovered what is believed to have been part of the Aqua Appia, Rome's oldest-known aqueduct, which dates back to 312 B.C. The remains were found near the Colosseum, at around 55 to 60 feet below Piazza Celimontana, a depth usually unreachable by archaeological excavation, says Simona Morretta of the Archaeological Superintendency of Rome. The section of aqueduct measures 6.5 feet tall and is made up of large gray, granular tufa blocks arranged in five rows. "The total absence of any traces of limestone inside the duct suggests that its use over time has been limited," says Morretta, "or that the structure was abandoned just after a maintenance intervention." It stretches for more than 100 feet and continues beyond the investigation area bounded by concrete bulkheads.

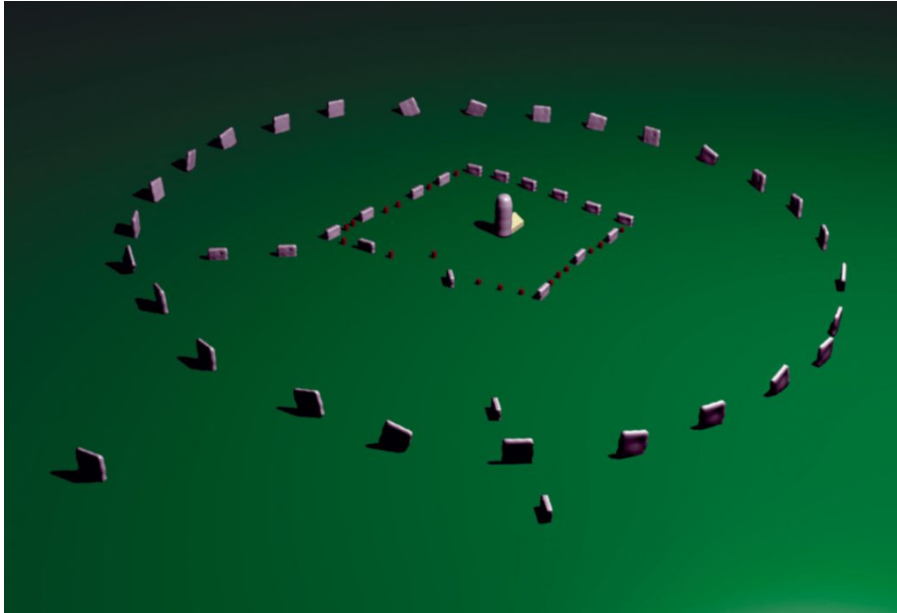
— ROSSELLA LORENZI

A section of what is believed to be the Aqua Appia, Rome's oldest aqueduct, extending more than 100 feet, has been uncovered during construction of a new subway line near the Colosseum.



THE SQUARE INSIDE AVEBURY'S CIRCLES

Wiltshire, England



A digital rendering of one of the inner Neolithic stone circles at Avebury, based on a new radar examination of the site, shows a square formation at the center believed to be the outline of a Neolithic building.

Avebury, the Neolithic monument just north of Stonehenge, may be best known for its outer stone circle, the largest of its kind in Europe, which encompasses the entire site. Archae-

ologists have now discovered that within one of its inner circles, there was an earlier, square formation. Using radar technology, they have identified evidence of an arrangement of stones that they

believe commemorated the footprint of a Neolithic house, a structure built as early as 3500 B.C. While past theories have postulated that Avebury was constructed from the outside in, these findings suggest the site instead sprang from a single building. "One interpretation is to see it like ripples on a pond," says Mark Gillings of the University of Leicester. "The house decays, its position is marked with a huge standing stone, and its orientation and shape are marked by the square. It may have been 300 years after the house was built that they decided to memorialize it," he explains. "By that stage it might have even been an ancestral place that had slipped into myth and legend."

— MARLEY BROWN



HOMO SAPIENS, EARLIER STILL

Jebel Irhoud, Morocco

Ex excavations at Jebel Irhoud, near Morocco's west coast, have uncovered the 300,000-year-old bones of some of the earliest members of the *Homo sapiens* lineage. Human bones were first discovered at the site in 1961, and their strange combination of archaic and modern features intrigued scientists, who guessed they belonged to Neanderthals and dated to about 40,000 years ago. In 2006, a team led by Jean-Jacques Hublin of the Max Planck Institute for Evolutionary Anthropology reopened excavations at Jebel Irhoud. This year, they revealed their results, providing a glimpse of the earliest members of the ancestral line that led to modern humans.

The Jebel Irhoud hominins apparently lived 350,000 years

after Neanderthals and *Homo sapiens* last shared a common ancestor, long enough for the two lineages to develop some obvious differences. The people of Jebel Irhoud had flat and short faces like modern humans, but their brains were more elongated and their teeth much larger. Their brow ridges were also more prominent than those of humans living today, but not as heavy as those of Neanderthals.

— ZACH ZORICH



This jawbone has been discovered with other remains of *Homo sapiens* dating back some 300,000 years. This group displays physical features that are similar to both modern humans and Neanderthals.

WHERE THE ICE AGE CARIBOU RANGED

Searching for prehistoric hunting grounds in an unlikely place

by JASON DALEY

UNIVERSITY OF MICHIGAN archaeologist John O'Shea was reading a book, some 10 years ago, about modern-day reindeer herders living in the Subarctic and some of the elaborate stone structures they use to manage their animals—usually called caribou in North America. O'Shea studies not only prehistoric cultures, but also nineteenth-century shipwrecks in the Great Lakes. That's why at around the same time he was reading up on human interactions with reindeer, he was also examining new underwater topographical maps of Lake Huron. Those charts showed that a rocky underwater feature known as Six Mile Shoal was actually a continuous underwater ridge stretching 112 miles from northeastern Michigan to southern Ontario.

As O'Shea looked at the map and envisioned what this ridge might have looked like in the past, he realized that around the end of the last Ice Age, some 9,900 years ago, it would not have been submerged. Rather, it would have been a land bridge, with icy lakes on either side and the receding glacial ice sheet just a few hundred miles to the north. The ridge would probably have remained much colder than the mainland, offering a refuge in a slowly warming world for animals and vegetation adapted to very cold environments. Such isolated pockets of archaic ecosystems that endure after broad continent-wide climate shifts are known as refugia. O'Shea believed that during the end of the Ice Age, this land bridge could have been just such a refugium, preserving the frigid ecosystem that caribou thrive in even while the glacial



ice sheet was in retreat. “It all came together for me—the fact that there was this geologic feature that would have been dry land 9,900 years ago that would still have had reindeer,” says O'Shea. And if herds of caribou had once migrated across this landscape, he reasoned, there were probably people hunting them. “I thought we could find signs of those hunters.”

Archaeologists have long suspected that since the Upper Midwest would have been an area attractive to these herds, the region's prehistoric Ice Age inhabitants, known as Paleo-Indians, would have relied heavily on them. But evidence for this way of life has been scant.

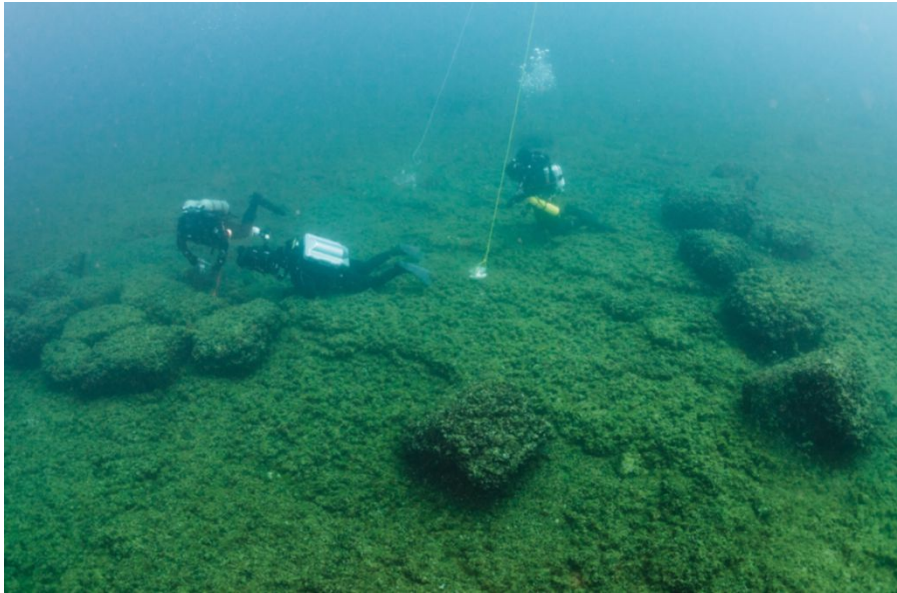
Acidic soils around the Great Lakes break down bones quickly, making it difficult to find the remains of caribou—or



A herd of caribou begins its autumn migration to wintering grounds in the Yukon. During the end of the last Ice Age, caribou are known to have similarly migrated along a still-frigid land bridge that is now submerged beneath Lake Huron.

of any ancient animal—in the region. Any stone hunting structures that may have existed were likely either knocked down by later settlers or are impossible to distinguish from walls and rock piles created by modern inhabitants. O'Shea thought that the ridge sitting beneath the waters of Lake Huron, now known as the Alpena-Amberley Ridge, could have acted as a time capsule. Though the lake is notoriously unpredictable and rough on the surface, its cold lower reaches are surprisingly calm, with gentle currents and 100 feet of visibility. O'Shea thought that some of the hunting structures that were destroyed in other parts of the Midwest might still persist on the submerged ridge, along with campsites, tools, and other remnants of the caribou hunters.

The idea, O'Shea admits, was a little bit wacky, but he thought his reasoning was sound even if locating the remains of that caribou hunting culture posed a daunting challenge. It would mean scanning hundreds of square miles of lake bed, 60 miles offshore. The chances of finding something as small as a campsite or hunting blind below the surface seemed remote. Furthermore, researching the ridge was a logistical nightmare, and meant signing up scuba-diving archaeologists, ROV operators, and boat pilots. It also meant sending researchers down 120 to 130 feet below the surface, the limit for divers using scuba gear, a depth at which they can only remain for short periods. Expectations for the project at the outset were kept low.



Archaeologists investigate now-submerged stone caribou-hunting structures at the bottom of Lake Huron. They were built some 9,000 years ago, when this section of the lake bed was a land bridge that lay on the animals' migration route.

THAT FIRST FIELD SEASON in 2008 was grueling. On the few days when the weather cooperated enough to get out on the big lake, O'Shea and his team would make the 60-mile journey in a small boat from the city of Alpena's port to the underwater ridge. There they identified three areas to scan, ranging from four to seven square miles. Day after day they followed a grid pattern, using side-scanning sonar to get an overview of the ridge, creating a map of the land below. This systematic approach paid off, and they were able to identify ancient shorelines, prehistoric rivers, lakes, and bogs. O'Shea hoped they could use that preliminary data to pinpoint possible areas for investigation during a second field season. But then, something unexpected happened. During one pass, a bright line of rocks stood out. The team sent an ROV down and found, to their surprise, that it was a man-made drive lane, a long stone alignment used to herd caribou into a corral, and a hunting blind where Paleoindians would have waited to kill the animals. "It was just dumb luck," says O'Shea. If the boat had been traveling at even a slightly different angle, the team would have missed the drive lane.

Since then, over almost a decade of field seasons, O'Shea's team has identified more than 60 drive lanes and hunting blinds, as well as structures that were possibly caribou meat caches, all across the Alpena-Amberley Ridge. One reason they have found so many archaeological sites intact is that, although the ridge's original layer of thin topsoil has washed away, no new sediment covered it, leaving a perfectly preserved record of the people who lived there. "That's what's nice about our research site," says O'Shea. "There's only a 2,000-year window where it was dry land. Then it was submerged and didn't reemerge again."

Dating of the remains of ancient trees on the ridge based on wood samples and ancient pollen has shown that the land bridge would have indeed been a subarctic environment, says

University of Texas at Arlington archaeologist Ashley Lemke, who has worked on the project for six seasons. She points out that while they moved across the ridge, Paleoindians would have encountered a rocky landscape with thin soils, covered in bogs and marshes. While the landscapes on the mainland were slowly developing into the grassland, savannah, and forest ecosystems that exist there today, the land bridge was covered in sparse clumps of trees such as spruce, tamarack, and aspen. "It was an Ice Age-like environment," says Lemke. "That's why caribou would be there. This is a place where the Ice Age lasted a little longer."

During the winter months, the ridge would have been brutally cold, leading O'Shea and his team to believe that the Paleoindians would not have lived there year-round. In the autumn, when caribou herds were healthiest, with the best meat

and hides, O'Shea believes small family groups would camp on the land bridge as the animals migrated across it toward the southeast. The families would hunt in small groups, processing hides and drying and storing the meat in stone caches on the ridge for the winter. Because the cold winters froze the lake solid, O'Shea believes the caribou hunters would have been able to travel over the ice to the ridge in the winter and collect meat when they needed to.

In the spring, as the herds of caribou headed up the ridge to the northwest, the hunters would have engaged in a different style of hunting, working in larger groups to herd the caribou down through stone drive lanes and processing large amounts of meat. "Spring is the direst time in northern climates," says O'Shea, who notes that after enduring a harsh winter, the undernourished Paleoindians would have needed a way to get large amounts of meat quickly. "They used more complex hunting methods that took a lot of people to operate," he says. "Then they would sit around for a couple of weeks eating caribou."

WHILE THE TEAM HAS successfully located a number of sites and even excavated a handful of stone tools, O'Shea knew that surveying the entire ridge would take years of mind-numbing radar scanning and cost a lot of money. So he turned to computer scientist Robert Reynolds, director of the Artificial Intelligence Laboratory at Wayne State University, for help in better understanding how the hunters might have exploited the land bridge and where still more sites might be located. "Initially the team was using their own intuition about the landscape to predict where they might locate sites," says Reynolds. "They felt they reached a limit of their intuition and called us in to create a 3-D virtual model of the ridge." By combining this virtual model of the refugium with information about caribou migratory behavior and ethnographic and archaeological data, Reynolds was able

to simulate how caribou and hunters might both have used the landscape.

The model produced a list of hot spots on the ridge where the researchers should look for hunting structures. In 2015, O'Shea tested the predictions, exploring two sites that Reynolds had flagged, one of which produced a previously undiscovered hunting structure. The simulation also predicted where one of the drive lanes that had already been discovered would appear. Now O'Shea and Reynolds want to fine-tune the simulation to help them pinpoint the most likely location of campsites on the ridge. They are currently in talks with modern caribou hunters living in Alaska who may come down and use the simulator. The hope is that with their experience and traditional knowledge, the modern hunters can "walk" through the model of the ridge and point out likely spots for both hunting structures and family encampments, which can then be explored in future field seasons.

The team is also using other new technologies to search the ridge's submerged Ice Age landscape for campsites, which have remained elusive. Last summer, they began testing an autonomous underwater vehicle that can travel much closer to the lake floor than tethered ROVs, which allows it to create even more detailed sonar imagery of the ridge than was previously possible. "If our model is right and the fall hunting is done in small family groups, my expectation is we should have lots of little campsites cycling over the years," says O'Shea. "We should see a lot of them."

Lemke, who is the primary ROV pilot for the team, explains that while the structures on the ridge were almost certainly built for hunting caribou, there is still scant evidence that the animals actually existed there—just one piece of burned caribou bone and a single tooth collected thus far. This can be

In addition to identifying more than 60 hunting sites on the now-underwater ridge, the team has also recovered small stone tools (top and middle) and one caribou tooth (bottom).

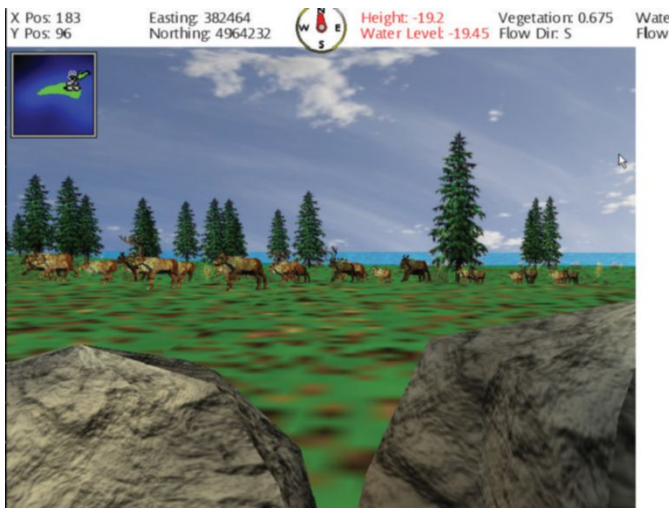


explained by the fact that the hunting structures they've been able to study, she says, would have been kept meticulously clean of bone and animal debris, since the scent of blood would scare off other caribou. Butchering and processing the animals would have taken place at other sites or at the camps where the hunters lived. These should be full of bones and evidence of the presence of caribou. "We've gotten good at finding out where they were hunting," says Lemke. "Now we're curious where they were living."

The technology upgrades have already yielded results. While watching video collected from an ROV exploring a drive-lane site called Drop 45, O'Shea noticed two stone circles, similar to tepee rings found in the western United States. A preliminary excavation found remnants of a fire hearth in the middle of the ring, a good indication that this was one of the long-sought habitation sites. The stone circles will be a major focus next season. O'Shea also hopes to begin using a three-person submersible in 2018 that can stay underwater for up to eight hours at a time, greatly increasing the team's ability to survey the site. It will also allow the researchers to investigate the bottom of a 500-foot-deep cliff edge they have not been able to explore so far.

All this work is helping complete a picture of an Ice Age landscape that sustained caribou and caribou hunters alike for two millennia. It disappeared under the waves of Lake Huron some 8,000 years ago, wholly forgotten until O'Shea's unusually broad reading habits led him to discover it. "It was serendipity," says O'Shea. "But the fact that we found the hunting structures isn't shocking to me. It's thinking like a scientist. Science has a creative component that is, or should be, present at the beginning of every research question."

A number of other questions remain. For example, O'Shea says he's not yet sure if the hunters stayed out on the ridge during the summer to fish, or if they returned to camps on the mainland. One of the projects the team is working on when Huron is too rough for underwater exploration—which it often is—is excavating sites on mainland Michigan that may have been occupied by the caribou hunters during summer and winter months, when they were not hunting on the ridge. "We've come up with two candidate sites with tool assemblages in the same date range," says O'Shea. "We want to tie all the pieces of their system together to see how they operated." He suggests that relying on an isolated Ice Age landscape for their way of life must have made the caribou hunters fundamentally different from their contemporaries. "We want to know just how different they were." ■



Working with archaeologists, computer scientists created a 3-D model of the land bridge's landscape along with algorithms that can simulate the behavior of both caribou and hunters to help determine the locations of hunting structures.

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City Hotel china fragments

NEW ZEALAND'S FIRST CITY, UNCOVERED

Stories of the founding inhabitants of Christchurch have been brought to light as the rubble from a major earthquake continues to be cleared

by KATE RAVILIOUS

ON FEBRUARY 22, 2011, New Zealand's second-largest city, Christchurch, suffered a devastating earthquake. Overall, between 2010 and 2012, there would be a series of quakes, but this one, because of its combination of magnitude and depth, was rated as "IX" or "extreme." A previously unknown fault juddered to life and ripped through the city, destroying roads, buildings, pipes, electricity lines, and anything else in its path. One hundred eighty-five people lost their lives to the magnitude 6.3 earthquake, and over 10,000 homes and businesses had to be demolished. In the space of a few minutes this prosperous and thriving city became a tangled pile of rubble. "It was

many months before we were allowed to go near the city center again," says Christchurch resident Sharron Farnley, "and when we did, we couldn't find our way because so many landmarks had been destroyed."

Without a doubt, the day the quake struck was one of Christchurch's darkest, but there has been one small silver lining. From beneath the scores of earthquake-damaged buildings, some of which still await demolition, stories of nineteenth-century Christchurch have emerged—stories of real, everyday people that would otherwise never have seen the light of day. Now, six years after the earthquake, Katharine Watson, founder of Underground Overground Archaeology, and her colleagues have recovered more than 100,000



Cox's stoneware shoe-polish bottles



Hathaway's glass shoe-polish bottles



Patent medicine bottle



Medicine bottle fragment

Artifacts dating to 19th-century Christchurch, unearthed by the 2011 quake, tell of an entrepreneurial immigrant population bent on success in a city offering both opportunities and challenges. China (fragments, opposite) was designed especially for Christchurch's City Hotel, founded by a man who ultimately became mayor. Illegal practices abounded, and stoneware and glass shoe-polish bottles (above) reveal brand tampering. Christchurch's unsanitary conditions led to serious public health crises. Patent medicines (bottles, left) promised cures for everything from cholera to influenza during epidemics.

artifacts and excavated upwards of 1,000 archaeological sites around Christchurch. The analysis of this immense quantity of material is going to take years, but already the excavations are helping paint a fresh picture of the formative years of a city built by immigrants.

ON DECEMBER 16, 1850, *Charlotte Jane* anchored in Lyttelton Harbour, New Zealand, following an arduous three-month journey from Plymouth Sound, England. For the 150 or so passengers, it must have been a relief to escape their cramped confines and stagger onto land, but their journey wasn't finished yet. After a brief rest in some hastily erected barracks, this pioneering group, which included

families with young children, bundled up their belongings, climbed the steep path to the summit of the Port Hills, and made their way down to the swampy plains of Christchurch.

Originally envisioned as an Anglican Church settlement by two gentleman farmers, Edward Gibbon Wakefield and John Robert Godley, the city of today was shaped in a variety of ways by the 800 or so English people who made up the first wave of settlers at the end of 1850. Most of them were willing to conform to the vision of the founders. "Almost all of the early prominent settlers built houses in the Gothic Revival style, signaling a desire to return to an older version of England, reminiscent of medieval hierarchy, where capitalism didn't hold sway," explains Watson. But there were also some



Among household items unearthed at the Armagh Street home of working-man-turned-politician Edward Hiorns are these clay pipes bearing the name of William Gladstone and the message "Reform." Hiorns' goal was to enfranchise the working classes of Christchurch.



contrary characters who defied Wakefield and Godley's vision. The earthquake revealed traces of some of these rebellious personalities.

Take Edward Hiorns, a rough-and-ready working-class man, who arrived from England in 1862 and set himself up as a plumber, tinsmith, and metalworker, based at a house on Armagh Street East, close to the center of present-day Christchurch. Historical records hint that he was a politically ambitious man. Later in the 1860s, he became a member of the Canterbury Freehold Land Association, a liberal organization that aimed to assist working men with the purchase of land. By 1872 he had branched out, becoming the proprietor of the Central Hotel. His argumentative nature shines through in court records from the 1870s, showing that he appeared as both plaintiff and defendant in cases covering everything from the theft of watches to bail forfeit, forgery, and the inappropriate sale of alcohol. He was also active in the Oddfellows, a fraternal benefit society, and by the 1880s—two decades after he had arrived—he had gained enough recognition to win a seat on the city council. But these written records provide only a partial picture.

After the 2011 earthquake, many of the Armagh Street buildings had to be demolished, including the commercial units where Hiorns' property had been located. Once the debris was cleared, Watson and her team found a number of rubbish pits on Hiorns' original plot. One contained a lot of tin and iron while another was filled with domestic artifacts. Most productive of all was a large depression at the back of the plot from which 1,037 artifacts emerged. Many of them date to when Hiorns lived there and they include ceramics and tableware, household items such as chamber pots, ointment pots, shoes, clothing, pharmaceutical bottles, and children's toys such as marbles. There was also a notably large number of alcohol bottles and glass serving ware. "It was obvious that he must have done a lot of entertaining," explains Watson. Meanwhile, his political activism became apparent with the find of a clutch of clay pipes, including one bearing the name and bust of William Gladstone, the liberal English politician, and another with the name of Garibaldi, the nationalist and progressive Italian general. "This

ties in with Hiorns' strong political engagement," Watson says, "and suggests someone with more radical ideas who was trying to enfranchise the working classes."

New Zealand at this time epitomized the Victorian entrepreneurial spirit, and with that came a fluidity of class and social affluence in colonial settlements. The artifacts from Armagh Street hint that Hiorns may have been instrumental in some of the major changes that occurred during this period. When Hiorns first arrived in New Zealand the only people allowed to vote were white British males 21 and older who owned land worth at least £50. By 1879,

Parliament decided to remove the requirement of property ownership, giving rise to working-class politicians, and by 1893 women were given the right to vote—making New Zealand the first country in the world to grant women's suffrage. There is no direct evidence, but it is easy to imagine groups of activists gathering at Hiorns' Armagh Street house, plotting their next move in the fight for social justice. "There were a lot of people like Hiorns who came to New Zealand, people who arrived with little but who were determined to make their fortune," says Watson. "Theirs were the hands that shaped a city and, through the city, helped to shape a nation."

Hiorns eventually made it big, purchasing the finest residence in town, known as Linwood House. It was anything but ordinary. Hiorns was continuing to make a bold and unconventional statement. Before Hiorns bought Linwood it had belonged to Joseph Brittan, a surgeon, who had arrived in Christchurch in February 1852 with his wife and four children. Running away from the scandal of having married his late wife's sister (which was illegal in the United Kingdom at the time), Brittan was looking for a fresh start, but his strong personality soon sparked controversy. Straightaway he demonstrated his contrariness by building Linwood House, a vast Regency-style building, completely out of character with the homes of other prominent settlers in Christchurch. "It was a show-off, 'look-at-me' house, made from imported bricks, and echoing the symmetrical proportions of the grand estates being built by industrialists back home," says Watson. By building his house in this style, Brittan was openly demonstrating his opposition to Wakefield and Godley's vision and promoting his own capitalist ideals.

Historical records paint a picture of Brittan as an eloquent speaker, but with a biting and sarcastic manner, who was disliked and feared by many. Nonetheless, he became highly influential in Christchurch, serving as a provincial councillor for many years and founding and editing a local newspaper, the *Canterbury Standard*. For some Christchurch residents, such as Edward Hiorns, Brittan provided an aspirational example.

Ultimately, Linwood House was no match for the 2011 earthquake. The damage was so severe that the house had to



Linwood House (top), built by the enterprising surgeon Joseph Brittan, was intended to broadcast its owner's affluence. The 2011 quake exposed Linwood's interior brick walls (above), which were an extravagance in their day.

be brought down, but just before it was reduced to rubble Watson and her colleagues managed to take a look. Despite the structure's partial collapse, they could see that Linwood's internal walls were brick—an extravagance in the extreme, since timber would have been far cheaper. It had a generous number of doorways and windows that had been bricked up by subsequent owners—but the quake had shaken much of the plasterwork away. It was originally a very open house, built for entertaining, with a wide entrance hall, multiple reception rooms, and a large staircase leading up to many bedrooms. Even the sash windows were unusual, with folded rectangular lead weights instead of the conventional circular ones. Disap-

pointingly, Watson and her colleagues didn't find anything of interest under Linwood House, and most likely the detritus from both Hiorns' and Brittan's periods of residency is buried under neighboring plots. Even so, Watson concludes, "Absolutely everything about this house was different."

BY THE 1870s, the increase in the city's population had led to serious health problems, and waterborne diseases in particular were rife. The annual death rate for the city was 30.4 people per 1,000—almost double the national figure—with diphtheria and cholera being two of the biggest killers. Meanwhile, the typhoid epidemic of 1875–1876 resulted in 152 deaths. The fear that people must have felt is reflected in the plethora of medicine bottles found in rubbish pits dating to this period. "We've found lots of patent medicine bottles which promise to cure everything," says Watson. "Essentially, they are selling hope."

Even if the medicines had been effective, the real issue in the city was sanitation. Each local area was responsible for its own drainage, resulting in a network of ditches, roadside channels, culverts, and sewers, which usually wound their way to the Avon and Heathcote Rivers. "This meant that the sewage from one area could quickly become the problem of the next area," explains Hamish Williams, who specializes in drainage-related excavations for Underground Overground. Kitchen waste was dumped and chamber pots were emptied into channels running along the sides of streets, which frequently became clogged, resulting in a putrid backlog upstream. Williams and his team have uncovered some of these early drainage conduits, such as a boxed timber culvert found under Ferry Road.

Thanks to a state-of-the-art underground system of brick and concrete sewers that, despite the extra expense, kept storm water and wastewater separate, by 1882 much of the stench had been removed from the city. Brick "flushing tanks," which



This boxed timber culvert, located under Ferry Road in Christchurch, is one of the city's earliest drainage conduits, part of a network of ditches and roadside channels that all contributed to a backup of sewage and the spread of disease.

periodically released a torrent of water into the sewer pipes, and a steam-powered pumping station, kept the sewage flowing until it reached a sewage farm on the outskirts of town.

Excavating some of the cracked pipes following the earthquake has revealed how much of an undertaking it was to create these sewers. Workers digging into the waterlogged, swampy ground apparently had to construct timber-lined trenches up to 13 feet deep and encase the large sewer mains in protective concrete. "It would be a challenging undertaking in the modern day, let alone back then," says Williams. And at the pumping station, workers had to outwit the baby eels that wriggled out of the watery layers, threatening to clog up the pumping apparatus. "They had to construct the tank aboveground and then sink it down afterwards," explains Williams. The end result was a fully functioning drainage system that dramatically lowered mortality rates and improved living standards in Christchurch.

DESPITE THE GREAT DISTANCE—the journey from Britain to New Zealand by clipper could take 100 days—the people of Christchurch imported a surprisingly large quantity of goods from England. Excavations have revealed that china crockery was almost always imported, with trademarks, crests, and symbols showing that it usually came from the Staffordshire potteries region. And glass was imported up until the 1920s, initially from the United Kingdom, but then also from the United States from the 1890s onward. "Our perception is that Christchurch would have felt very remote in the nineteenth century," says Watson, "but actually it was strongly linked to the global trade network and was in some ways more connected to the rest

of the world than it is today."

When it came to perishable products, this long-distance trade created extra challenges. Excavating a site in the center of Christchurch, Watson and her colleagues came across rubbish pits associated with a bonded warehouse (a building used to store imports and assess the duties and taxes that needed to be paid). In one pit the archaeologists uncovered 126 black beer bottles and, although they were broken, their tops were still sealed and bore the distinctive trademark of J&R Tennent's Pale Ale, brewed at the Wellpark Brewery in Scotland. The layout of the bottles suggested that they had been full when thrown into the pit and were still sealed. So why were people throwing away full bottles of beer, particularly after having gone to the effort of importing them over such a long distance?

"Bottled beer was a lot more unpredictable—both in quality and preservation—during the nineteenth century than it is now, and it wasn't uncommon for batches to go bad," explains Underground Overground archaeologist Jessie Garland. A

Christchurch enjoyed robust trade, but some imports, such as beer, were highly perishable. This neck and seal are from a beer bottle, just one of hundreds discarded after a long sea voyage.





A rubbish pit at the site of a bonded warehouse has been found to contain 126 black beer bottles. The bottles, with seals intact, contained J&R Tennent's Pale Ale, brewed at the Wellpark Brewery in Scotland.

second, similar pit at the same location, containing bottles stamped with T.B. Hall & Co, Liverpool, suggests that this kind of wastage was relatively common, and perhaps not surprising when you consider the extremes of temperature likely to be encountered on the voyage and the difficulty of estimating sales demand so far in advance.

By the 1880s a global economic depression was keenly felt by the residents of Christchurch, and archaeologists have discovered evidence that some people resorted to illegal practices in order to make ends meet. At a site on Draper Street, belonging to one Charles Henry Cox, Watson discovered more than 50 glass Hawthaway's shoe-polish bottles—advertised in New Zealand as “a necessity in every family” from at least 1879 until 1894. Alongside the Hawthaway's bottles the archaeologists also uncovered over 50 standard stoneware blacking bottles.

A newspaper advertisement from the time for Cox's Pioneer Gloss being sold wholesale from the manufacturer on Draper Street suggests that this shoe polish may not have been all that it was advertised to be. “It seems that Charles Cox was rebottling the branded polish, perhaps into the stoneware blacking bottles, and selling it as his own premium brand,” explains Watson. This kind of adulteration of products was a major problem at the time.

Others, like John George Ruddenklau, worked their way up the hard and honest way. This German baker arrived in Christchurch in 1857 and immediately opened a bakery on the corner of High and Colombo Streets. At first, he shared the location with other businesses, but eventually he was successful enough to take over the whole corner. By 1861, he established the City Wine Vaults, which then morphed into the City Hotel, offering “every comfort and convenience appertaining to a first-class hotel.” Archaeologists discovered, at another site in Christchurch, china branded with the City Hotel name. Watson says, “The branding and decorative nature of the china perhaps tells us that Ruddenklau was quite ambitious and that image mattered to him.” In 1863 he entered the political fray and was elected to the Christchurch city council, and by 1881 he had become mayor of the city.

The archaeology of these early settlers—successful or not—tells of a city that became global and open in its outlook, where class boundaries were flexible, and where resourcefulness and hard work were respected. Despite the plans of its founders, the city created its own identity. Similar stories were likely being played out in many of the British colonies during the nineteenth century, but it is only in Christchurch, because of the earthquake, that these intimate portraits have emerged. “It is this adventurous, entrepreneurial spirit that I think plays a large part in the character of Christchurch,” says Watson, “both at its origins, and now, as the city rebuilds.” ■

Kate Ravilious is a science journalist based in York, United Kingdom.

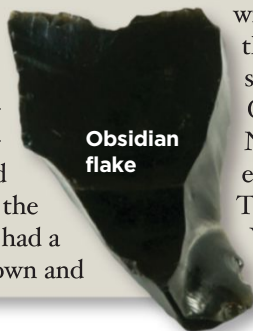
MAORI OCCUPATION

EUROPEAN COLONISTS WERE far from the first people to settle the Christchurch area. Archaeologists have found evidence of Maori occupation, mostly along the coast, dating back as far as A.D. 1250. To date, the evidence has been rather piecemeal, but the 2011 earthquake, along with another severe one in 2010, has helped fill some significant gaps.

During the replacement of a broken sewer main in the Raekura, or Redcliffs, area, Underground Overground's Maori expert, Tristan Wadsworth, excavated a shell midden dating to just over 650 years ago. The jumble of shells and bones revealed that the main food source was the now-extinct moa bird, followed closely by shellfish. Fish bones were surprisingly rare. “Previously archaeologists have tended to dismiss mud snails as a Maori food source, but the high number of shells we found suggest that they had a specialized harvesting strategy and must have known and

targeted the mud snail shell beds,” says Wadsworth.

Meanwhile, the removal of an old pumping station (due to earthquake damage) at Moncks Cave exposed a previously unrecognized tool production area. Wadsworth and his colleagues uncovered an anvil stone, an obsidian core, and dozens of tiny (less than 0.4 inches long), very sharp obsidian flakes. Most likely the small flakes would have been made by resting the obsidian core on the anvil stone, then hitting it with a hammerstone. “The flakes were so tiny that we think that only women or children would have had small enough hands to use them,” says Wadsworth. Obsidian had to be imported from New Zealand's North Island, and these tiny flakes indicate that every scrap of this precious material was put to use. These flakes might have been used in flax working, Wadsworth speculates, particularly since it was traditionally a female occupation.—KR



ZEUS. SCION OF THE TITANS, ruler of the Olympian gods, and infamous seducer of both mortals and immortals alike. Within the canon of Greek mythology, there is no figure as central and none as sacred. According to one story, Zeus was born on the remote peak of Mount Lykaion in the heart of the Peloponnese. Throughout antiquity, the mountain was revered as hallowed ground where the cult of Zeus Lykaeos performed solemn rituals in the god's honor. Pilgrims from all over Greece came to bestow offerings

and constitute the oldest material yet uncovered associated with the cult of Zeus. They are providing new insight into early Greek religious practices, Greek culture, and the origins of Zeus himself. Mount Lykaion is, quintessentially, a place where mythology and reality are interwoven.

IN THE SECOND CENTURY A.D., the Greek travel writer Pausanias documented his trip to Mount Lykaion in the bucolic region of Arcadia. By then, the Sanctuary of Zeus had already fallen into disrepair, but he marveled at the ruins that

A VIEW FROM THE

Excavations at the Sanctuary of Zeus on Mount Lykaion have revealed the earliest evidence to date associated with the cult of ancient Greece's most powerful Olympian god

by JASON URBANUS

by burning animal bones, pouring libations of wine, or proffering gifts. These rites were even rumored to include human sacrifice. These tales must surely belong to the realm of myth and legend. Yet, recent archaeological work atop the nearly 5,000-foot peak has unearthed fascinating evidence left behind by worshippers of Greece's most powerful god that is lending credence to the age-old myths. The remnants of these rituals, accumulated over a period of 1,300 years, date back to the sixteenth century B.C.

remained: the hippodrome and stadium, the marble plinths, now statue-less, and most of all, the sacred altar of Zeus. Eighteen hundred years later, although some of the stones had been carried away, the site did not appear much different to archaeologist David Gilman Romano when he visited the sanctuary in the 1970s. No roads had yet been built to the top of the mountain, so Gilman Romano and two colleagues hiked four hours from the closest village accessible by taxi. "When I

got up there I thought, ‘Wow, there is something special about this place.’ I was so impressed with the beauty and majesty of the site. Not only was there a stadium and hippodrome, but it was also the birthplace of Zeus with the famous altar. From the beginning,” he says, “there was a kind of emotional bond that I had with the site, so I pledged to myself that I would return one day to work there.”

Today, Gilman Romano is codirector of the Mt. Lykaion Excavation and Survey Project, under the directorship of Anna Vasiliki Karapanagiotou of the Ephorate of Antiquities of

of ancient Greek religion. To codirector Mary Voyatzis, the rugged, isolated nature of Mount Lykaion offers a potentially unparalleled glimpse into early Greek culture, since the area was not subject to outside influences. “We are dealing with a place that is just so old, it’s like going back in time. It’s not Athens or Corinth, it’s not a major cosmopolitan area, so older aspects of culture seem to be preserved, and that is what we see when we look at the evidence,” she says.

The sanctuary actually comprises two separate areas, an upper and a lower district, both of which are currently being

BIRTHPLACE OF ZEUS

The top of Mount Lykaion offers sweeping views across the Peloponnese. The ancient Greeks believed the mountain was the birthplace of Zeus. Near its summit lies the Sanctuary of Zeus Lykaios.

Arcadia. The project is a collaboration between the University of Arizona, the American School of Classical Studies at Athens, the Arcadian Ephorate, and the Hellenic Ministry of Culture and Sports. Although the site was briefly excavated by Greek archaeologists in the early twentieth century, this project is the first to systematically explore, excavate, and document the far-flung Sanctuary of Zeus. The work over the past 14 years has rewritten the history of the site and, possibly, the history

studied. The upper sanctuary is located at the very top of the 4,534-foot southern peak (Mount Lykaion has two peaks) and consists of the sacred precinct and the altar of Zeus. The lower sanctuary, situated in a meadow several hundred feet below the summit, contains the complex of buildings associated with the Lykaion games, which were held every four years in Zeus’ honor. It includes the only extant ancient Greek hippodrome.

Sanctuaries in ancient Greece were places where people



The ash altar of Zeus (top), located at the peak of Mount Lykaion, is made up of the ash and bone of sacrificed animals and other votive offerings, all of which were part of the ritual worship of Zeus. A collection of broken Mycenaean *kylikes*, or drinking cups (above, left), has been found. A stone platform (above, right) was likely constructed for the placement of offerings.

communicated with their gods. They were considered portals to the divine world where deities and humans could interact, places where mortals could pray to the gods and the gods could listen, if so willing. Although Mount Lykaion is not the tallest mountain in the Peloponnese, it offers commanding views across almost the entirety of the peninsula. It is easy to understand why the Greeks felt the presence of their sky god Zeus there—his many epithets included “bringer of rain,” “storm gatherer,” and “lightning wielder.” Zeus’ companion was often the eagle, who, as ruler of the skies, was his counterpart in the animal kingdom. Even today, these elements of Zeus’ mythology remain eerily present at the site. Turbulent weather and lightning storms can arise at a moment’s notice, causing archaeologists to scramble. “When a storm blows in, everyone has to get down out of there in a big rush,” says Gilman

Romano. They also have the occasional close encounter with eagles. “One day we were up here and two eagles just floated up,” he says. “You don’t see anything and then all of a sudden, there they are flying right above us.”

While these environmental and meteorological phenomena may have led prehistoric Greek communities to first identify the spirits of the mountain with Zeus, two other natural features of Mount Lykaion were even more influential in the foundation of the sanctuary. “I think it has more to do with the water and the seismic activity here,” explains Gilman Romano. Just below the peak, a large natural spring emanates from the ground. Springs like this were thought not only to possess mystical properties but were also essential aspects of Greek sanctuaries since worshippers were required to undergo a purification process before they were allowed to enter the sacred precinct.

But ancient Greeks were also equally mesmerized by seismic disturbances. Although it may seem counterproductive given the likelihood for destruction, some of the most important sanctuaries, like that of Apollo at

Delphi, were built on or adjacent to active fault lines. Understandably, the literal moving of the earth was equated with mysterious energies and divinities. According to geologist George Davis, Mount Lykaion’s topography has been distinctly shaped by its seismic history. He identified several different faults running through the site, which would have captivated the ancient Greeks. “Ground movement due to earthquakes, nearby landslides, and ground rupture are the ingredients for a sanctuary full of divine power,” he says. “I suspect that the Zeus cult followers approached the altar summit with awe.”

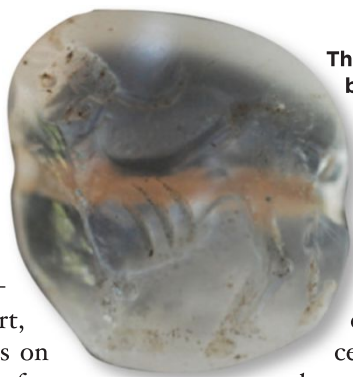
The altar of Zeus is not a standing structure, as we might think of an altar today, but instead a mound of ash and pulverized bone. Upon first glance, it appears rather inconsequential. “When you go to the site and see the ash altar, it looks like nothing. It just looks like a hill,” remarks Voyatzis. But that hill is effectively an

enormous pile of debris accumulated from more than a thousand years' worth of sacrifices and dedications. The mound has a diameter of over 100 feet, reaches five feet deep in places, and covers an area of 7,500 square feet, the entirety of the summit.

Greek ritual worship was an elaborate affair, consisting of processions, purifications, dancing, and feasting. At its heart, though, was the presentation of offerings on the altar, where a mortal might request a favor from the god or goddess, offer their thanks, or simply seek to foster good relations. A worshipper might pour out a wine libation or leave a small votive gift. At the Sanctuary of Zeus at Mount Lykaion, a major component of this ritual was the *thysia*, in which an animal was slaughtered and sacrificed. Some parts of the animal were set aside for human consumption at the celebratory feast, while others were brought to the altar and burned as an offering to Zeus. The bones were stripped of their meat, wrapped in fat, and set on fire. The dedicator hoped that the aromatic smoke from the fires would radiate upward to grab Zeus' attention and please him. The recent excavations have shown that it is the remains of this process, performed repeatedly for millennia, that are visible today. "They started making dedications on the bedrock and then over time the burning of the animal bone, the fat, and the mud, the liquids, and pottery fragments accumulated and it became this huge mound," Voyatzis explains.

It is impossible to estimate exactly how many burned animal bones are buried within the ashen mound today, perhaps tens of thousands. Recent analyses of samples taken from the altar indicate that 98 percent of the faunal remains belong to either sheep or goat, with much smaller amounts of pig and cattle. Ninety-eight percent of the animal bones were also classified either as thighbones (femur and attached patella) or tailbones. Since the thighbone was the largest bone in the body, it would seem fitting that Zeus be presented with that as an offering, but Voyatzis says that the tail was burned for different reasons: "These bones were put on the fire because they would curl up in a certain direction and provide an omen depending on which way they curled."

Offerings left by worshippers on the altar of Zeus include (left to right) animal figurines, silver coins, including one bearing an eagle, known to symbolize Zeus' power, and this Mycenaean askos, or cup.



The first clue that worship at the sanctuary might be older than previously thought came with the discovery of a 15th-century B.C. Minoan rock-crystal seal depicting a bull.

GILMAN ROMANO AND Voyatzis were aware of the ash altar's existence prior to their excavations; they just did not know precisely how old it was. The early twentieth-century excavators dated the altar to around the seventh century B.C. and for more than a hundred years that date was accepted by scholars. For the past century, Mount Lykaion has often been overshadowed by another famous Sanctuary of Zeus located at Olympia, 22 miles away. Olympia, which contained one of the wonders of the ancient world—the statue of Zeus and its own ash altar dating to the eleventh century B.C.—was long considered older and more important. However, as Gilman Romano and Voyatzis began their excavations on Mount Lykaion, they soon encountered signs that the altar there might be older than anyone expected—much older.

The first major indicator of just how old the altar was came with the discovery of a Minoan rock-crystal lentoid, or lens-shaped, seal depicting a bull. The object dated to the fifteenth century B.C. "The Minoan seal stone blew us away," says Voyatzis. "We thought maybe this was our first clue that we have material here earlier than people previously thought." The archaeologists were initially cautious not to read too much into the singular find, which could have been left or dropped at the altar centuries after it was made. But as the team continued to dig, they unearthed massive amounts of Mycenaean drinking vessels, hundreds of them, which dated as far back as the sixteenth century B.C. In fact, they even found evidence that human activity on the peak extends all the way back into the Neolithic period (4000–3000 B.C.), although they are currently unsure how to characterize that behavior. The combination of Mycenaean pottery and radiocarbon dating of the animal bones indisputably confirmed that organized ritual cult activity had begun at the sanctuary by the sixteenth century B.C. The history of Greeks worshipping Zeus on Mount Lykaion had suddenly been pushed back nearly 1,000 years, further back than anywhere else in Greece. "This was a real surprise," says Gilman Romano.





Archaeologists were surprised to discover a human skeleton buried within the sacrificial altar to Zeus. The grave is currently believed to belong to an adolescent who was laid to rest in the 11th century B.C.

In addition to the burned animal bones and the array of ceramic vessels—cups, goblets, and bowls used for drinking wine and pouring libations—archaeologists have recovered scores of other small artifacts that were left on the altar as offerings. These include miniature bronze tripod cauldrons, lead wreaths, coins, iron axes, and human and animal terracotta figurines. Finding these small votive objects was somewhat expected, as excavations at other sacrificial altars have shown that these types of artifacts were commonly deposited. The discovery, however, of a human skeleton on the altar was completely unexpected. A number of ancient writers allude to the practice of human sacrifice on Mount Lykaion, making the find even more intriguing. Could this human burial actually confirm the veracity of these tales?

The skeleton was carefully laid out in a shallow grave with stone slabs covering only the pelvic area. It has now been removed from the altar and sent to a laboratory where it is currently undergoing testing to determine age, sex, and cause of death, but preliminary analysis suggests the remains are those of an adolescent who was buried around the eleventh century B.C. Although it is still too early to draw any conclusions concerning human sacrifice, Gilman Romano does recognize the suspicious nature of a human burial within the altar of Zeus, especially given the cult's nefarious reputation in antiquity. "Obviously, we have a lot of unanswered questions about all of this," he says. "The one thing that is clearest is that we are not digging a cemetery. This is a sacrificial altar to Zeus, where thousands of animal sacrifices were made in antiquity. And in the middle of it, right in the middle, we found a human skeleton."

THE OTHER MAJOR component of the Sanctuary of Zeus is the area associated with the athletic contests of the Lykaion games. This lower sanctuary contains a hip-



The lower sanctuary at Mount Lykaion is situated on a small plain several hundred feet below the summit. During the 1st millennium B.C., the athletic contests of the Lykaion games were held here.

podrome, stadium, stoa, bath facility, fountain house, administrative building, and other structures. Many of these buildings were investigated a century ago, but the current excavations are continuing to reveal new information about this part of the site. Last year workers unearthed a large staircase and corridor, presumably used by athletes processing toward the competitions. For Gilman Romano, excavations in the lower sanctuary have the potential to answer key questions about the connection between religious rituals and athletic games. Athletic contests were also held at other sanctuaries of Zeus, most famously at Olympia (hence, the modern "Olympic Games"), but it is not known precisely when games in general originated. "It appears that those who competed in athletic competitions at Greek religious festivals were competing to please the god or goddess. One of the important questions that I have concerning Mount Lykaion is when and why athletic contests were associated with Zeus," says Gilman Romano. According to tradition, the first Olympics were held in Olympia in 776 B.C. At Mount Lykaion, the earliest evidence uncovered so far in the lower sanctuary dates only to the seventh century B.C.,

postdating the original Olympic games. But Gilman Romano and Voyatzis do not think this definitively means that the Olympic games were older than the Lykaion ones. They point out the fact that for decades the Sanctuary of Zeus at Olympia was considered the older of the two sanctuaries and that this has only recently been proved incorrect. With their project slated to continue for several more years, they hope to finally uncover conclusive evidence about the origins of the Lykaion games. “We now think Mount Lykaion was the precursor to Olympia, and that the Zeus cult began here in the Bronze Age, during the sixteenth century B.C., and then was later transposed to Olympia. Athletics could have been a part of the religious festivals from early times, since according to ancient sources the Lykaion festival was very old. Some sources even suggest older than Olympia,” Gilman Romano says.

TOWARD THE END of the first millennium B.C., activity at the Sanctuary of Zeus began to diminish. One of the main reasons for this was the founding of Megalopolis in 370 B.C. on the plains below Mount Lykaion. Megalopolis was the first urban center in Arcadia and eventually housed its own Sanctuary of Zeus Lykaeos. The Lykaion games were also subsequently transferred there. The Sanctuary of Zeus’ decline on Mount Lykaion may have simply been a result of logistics and convenience, as it was much easier to travel to Megalopolis to seek the favor of Zeus than to hike up a mountain. By the end of the third century B.C., dedications on the altar ceased altogether, but the legacy of the site was kept alive through the



A staircase and corridor recently uncovered in the lower sanctuary may have been used by athletes on their way to the stadium. Researchers are investigating the relationship between athletic competition and the worship of Zeus.

centuries by ancient writers who continued to recognize the remote Arcadian peak as the birthplace of Zeus.

For the directors of the Mt. Lykaion Excavation and Survey Project, the “birthplace” of Zeus has a more figurative than literal meaning. “I think the term may be derived from a memory in antiquity when Zeus’ worship became associated with the site,” says Voyatzis. “My guess is that prior to Zeus there was another ancient divinity or force worshipped on the mountaintop. In my opinion, the idea of his being born here is really a memory of the beginning of the new cult.”

Gilman Romano believes that the notion that Zeus was born on Mount Lykaion can even be interpreted as a reference to the birth of Greek culture itself. “I like to think that there may be more to the story and that the ‘birthplace’ connotation could have a broader meaning,” he says. “It could be a metaphor for the beginnings of Greek religion, culture, language, and Greek civilization in general—the beginnings of everything that is Greek is wrapped up into the place.”

For the local villagers living near the sanctuary today, the



Just a few hundred feet from the altar and sacred precinct of Zeus can be seen the roof of the small church of Prophetis Elias, where villagers today celebrate their most important religious festival.

heritage of their ancestors and their awareness of ancient Greece’s most powerful god remains very much alive. The Lykaion games have been restarted, held every four years again at the site of the ancient stadium. The village’s most important religious festival is celebrated at a small church located just a few hundred feet from Zeus’ sacrificial altar. Although there are other sites in the Greek world that are purported to be the birthplace of Zeus, particularly Mount Ida in Crete, there is no place other than Mount Lykaion that can boast such a long and pervasive connection to the god. As for it being his birthplace, Zeus himself seems to have put that debate to rest in a third-century B.C. poem by Callimachus. Even at this later date, there was enough speculation about Zeus’ actual birthplace for the exasperated poet to ask Zeus directly whether he was born in Arcadia or Crete. Zeus responds crisply, “Cretans are liars.” ■

Jason Urbanus is a contributing editor at ARCHAEOLOGY.

JUST BEYOND THE WALLED CITY of Angkor Thom, within the ancient Khmer metropolis of Angkor in northwestern Cambodia, archaeologists have unearthed evidence of what might be the world's first government healthcare system. They are investigating the remains of a twelfth-century hospital complex called Tonle Sngout, which sat at one of five gates to Angkor Thom. The hospital served as a bustling checkpoint for thousands of residents, travelers, patients, and pilgrims entering and leaving the city. The findings, including six rare statues, attest to the empire-building efforts of the Khmer king Jayavarman VII, who ruled between 1182 and 1218. Arguably the greatest of all

the Khmer rulers, he built Angkor Thom, instituted Buddhism as the state religion, and expanded the Khmer kingdom to its apogee by military conquest and by wielding the power of medicine and social services.

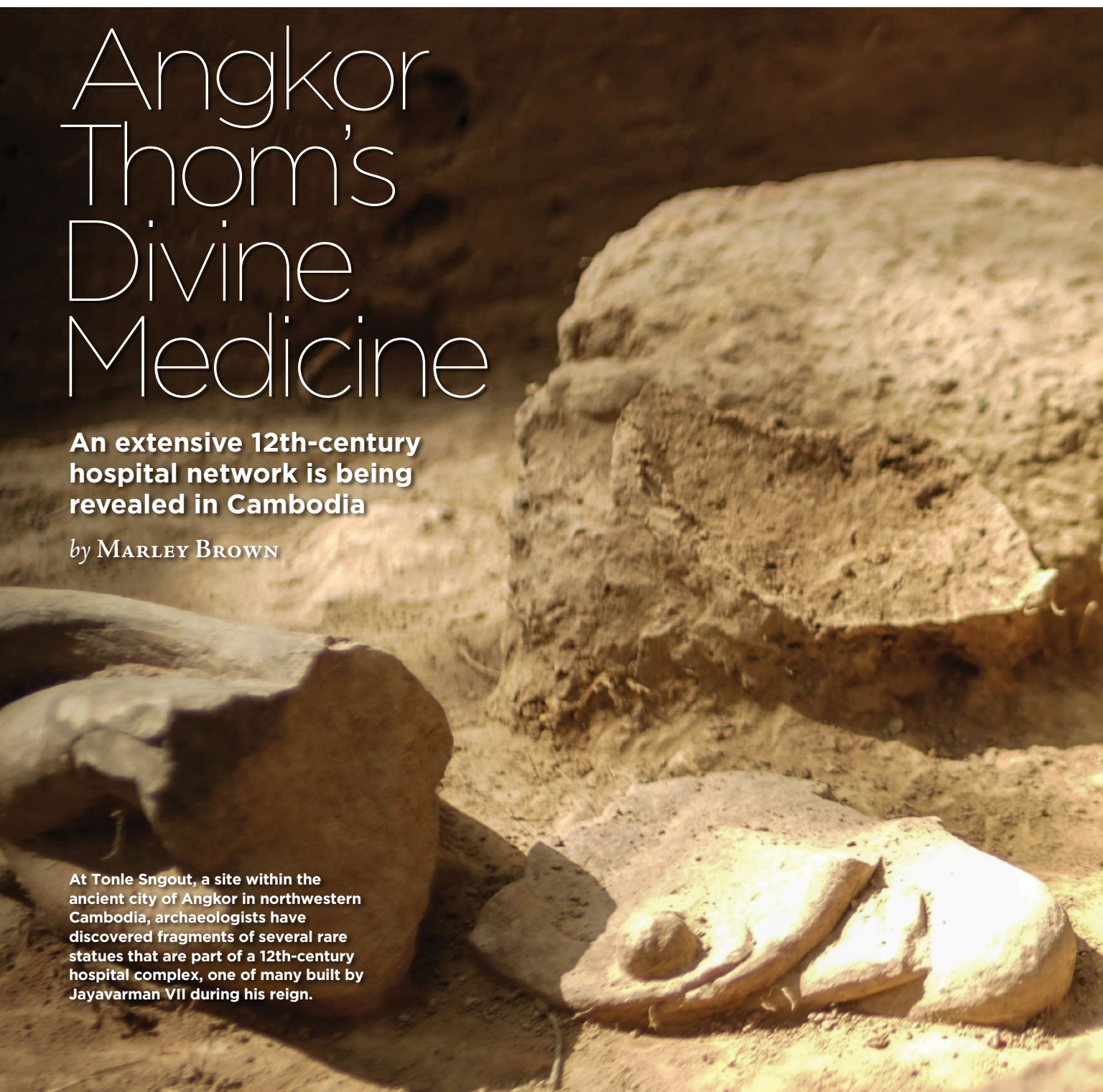
The world-famous archaeological site of Angkor, best known for Angkor Wat, the twelfth-century temple built by one of Jayavarman VII's Hindu predecessors, was the capital of the Khmer Empire from about the ninth through the fifteenth centuries. For most of that time, the kings of Angkor ruled over territory that ranged from the southern tip of Vietnam across Cambodia, Laos, and parts of Thailand, Myanmar, and China's Yunnan Province. Jayavarman VII was born into the

Angkor Thom's Divine Medicine

An extensive 12th-century hospital network is being revealed in Cambodia

by MARLEY BROWN

At Tonle Sngout, a site within the ancient city of Angkor in northwestern Cambodia, archaeologists have discovered fragments of several rare statues that are part of a 12th-century hospital complex, one of many built by Jayavarman VII during his reign.



royal family in Angkor around 1120 and lived to be nearly 100, dying in 1218. He took power after leading the campaign to expel invaders from neighboring Champa, who had occupied Angkor for several years. Scholars believe that as part of his effort to rebuild the kingdom and consolidate Khmer power, he embarked on a phase of construction across his empire, building a network of roads, canals, reservoirs, and temples—and exactly 102 hospitals, called *arogyasala*.

Peter Sharrock, an authority on Angkor under Jayavarman VII, explains that to reach his goals, the ruler adopted a specific form of Buddhism. “He needed the politically charged Tantric Buddhism that had for three centuries supported the

kings of China, Mongolia, Nepal, Pala India, and Srivijaya and Java in the south, as well as Korea and Japan,” he explains. “The Buddhist gurus who learned from Indian Brahmins how to develop state protection and expansion rituals took these across maritime Asia, as well as inland on the Silk Road. Medicine was an important part of this. It is sometimes called ‘state protection’ Buddhism, and was heavily politicized and directed at kings.”

A team led by Cambodia’s antiquities management body, APSARA National Authority, and the Singapore-based Yusof Ishak Institute of Southeast Asian Studies has recently been conducting excavations at the hospital ruins of Tonle Sngout,





This 12th-century relief panel from the Bayon temple in Angkor Thom, near Tonle Sngout, features hospital scenes that illustrate the care Jayavarman VII extended to subjects throughout his realm. A patient (center) can be seen having his pulse taken.

just outside of Angkor Thom's northern gate. Fortunately for them, Jayavarman VII documented his work and plans in stone inscriptions. The dedication stela of one of the first temples he built, Ta Prohm, just east of the walls of Angkor Thom, records the number of arogyasala across the empire and lays out exact rules for their operation. "The Ta Prohm dedication stela says 102 hospitals had been built across the kingdom by 1186," Sharrock explains. "It specifies the medical staff of each, and the amounts of medicine sent every three months to the whole chain—including the most rare and potent components that came from the king's personal store." The stela prescribes a hospital staff of 98, including a sacrificer and an astrologist, as well as medicinal items such as measures of rice, honey, wax, sesame, butter, pepper, cumin, nutmeg, camphor, sugar, cardamom, ginger, oregano, mustard, sandalwood, and even aquatic animals.

The hospitals that Jayavarman VII built followed these regulations, giving the archaeologists working at Angkor Thom's Tonle Sngout a clear idea of what to look for. "The complex has several features typical of a hospital built by Jayavarman VII," says David Kyle Latinis of the Yusof Ishak Institute. He is codirector, along with APSARA archaeologist Ea Darith, of a field school that has allowed students from across Asia to take part in the excavations. "It had a central shrine, ponds, a walkway, and a chapel, the stone foundations of which one can see still barely standing, as well as a separate area for physical and medicinal treatment."

Working over several acres, the team also conducted

Researchers from Cambodia's APSARA Authority and the Singapore-based Yusof Ishak Institute for Southeast Asian Studies take part in a Buddhist ceremony (right) after uncovering a sandstone guardian statue called a *Dvarapala*, which once stood sentry in front of the hospital complex.

excavations on the ancient road and canal along which goods and people flowed into Angkor Thom. It was during this phase of the project that they came across multiple statues, including five representations of Buddha and one imposing, nearly six-foot-tall sandstone sentry guard called a *Dvarapala*. "The first excavation unit on the western riverbank of the canal discovered a giant statue just seven inches below the surface," says Im Sokrithy, a lead researcher from APSARA. "We didn't expect to find it there because it's one of the two statues that would have been erected at the main gate of the hospital." The researchers were also surprised to find fragments of the five Buddha statues, including one they believe might be a *Bhaisajyaguru*, or "Medicine Buddha," a Tantric Buddhist bodhisattva. This kind of enlightened deity within the Mahayana Buddhist pantheon is believed to have achieved Nirvana, yet voluntarily returned to the earthly realm to assist humans. *Bhaisajyaguru* statues sat watch over all of



Jayavarman VII's hospitals, and while many have been identified at other sites throughout the ancient Khmer Empire, none have ever before been found at the hospitals of Angkor Thom.

Im and his colleagues had further reason to marvel at the find. Looting in Angkor has been widespread and devastating, not just in modern times but in antiquity as well. One of Jayavarman VII's successors, Jayavarman VIII, reinstated Brahmanism, an Indian religious form that birthed modern Hinduism, and destroyed many of Angkor's Buddhist icons and temples. This history makes the circumstances of the statue finds at Tonle Sngout even more remarkable. "Most of the statues are likely in situ," reports Latinis. "It doesn't appear they were intentionally buried. They may have been moved, but they don't look like they were vandalized in antiquity as much of the reliefs and statuary were during the post-Jayavarman VII Hindu resurgence."

The statues erected at Jayavarman VII's temples and hospitals can be seen as an extension of the ruler's own power. Determining their symbolism depends on knowledge of Khmer Buddhist iconography and interpretation of often-complex and subtle variations in style. Sharrock does not agree that the Tonle Sngout statue is a Khmer Bhaisajyaguru. He cites differences seen in examples of Bhaisajyaguru statues found at several Khmer sites in northeast Thailand that share the common motif of a seated Buddha with arms crossed at the chest holding a lightning bolt called a *vajra* and a bell called a *ghanta*. This Bhaisajyaguru is also often seen as part of a triad, with the bodhisattvas of sunlight and moonlight beside him. Instead, Sharrock is intrigued by the Dvarapala sentry guard. "The interest for me of the icons found by the team at Angkor



The Tonle Sngout statuary assemblage at Angkor (top) as it is first beginning to be uncovered. Archaeologists (above) carefully expose the head of a Buddha statue. These finds in Angkor are considered rare in light of the looting of antiquities that has plagued the ancient city.



Thom is that this hospital had a regal-looking, bejeweled door guardian," he says. "This is the first, and its discovery suggests to me that there was something particularly precious to protect there. This hospital may have included Jayavarman VII's own dispensary of herbs and minerals."

Whether or not the Buddha found at Angkor Thom's Tonle Sngout site, which sits in meditational repose and appears to hand out an offering, is in fact a Khmer Medicine Buddha, finding evidence of Jayavarman VII's hospital network helps move his accomplishments from the realm of myth into a tangible historical framework. "The medical industry has always been big business and a large part of any human economy," observes Latinis. "It's actually not all that surprising. We just seldom apply that kind of logic to understanding the past." Perhaps it is similarly unsurprising that an empire credited with a monument such as Angkor would have developed an equally impressive social infrastructure: "I call it the early Khmer NHS," after the United Kingdom's National Health Service, says Sharrock. "Early" because it was arguably three centuries before the first hospitals in Europe. It was an advanced medieval state, and Angkor was probably the biggest city on Earth in 1200." ■

Marley Brown is associate editor at *ARCHAEOLOGY*.



LETTER FROM ALBANIA

A ROAD TRIP THROUGH TIME

As a new pipeline cuts its way through the Balkans, archaeologists in Albania are grabbing every opportunity to expose the country's history—from the Neolithic to the present

by MATTHEW BRUNWASSER

Archaeologists funded by the Trans Adriatic Pipeline (TAP) excavated and studied this ancient hilltop settlement near Peshtan, Albania, on the planned route of the pipeline. The pipes were rerouted to avoid the 1,400-year-old settlement. Beyond the site are gas pipes ready to be laid, olive orchards, a turkey farm, and the Viosa River.



LETTER FROM ALBANIA



TAP is laying 133 miles of four-foot-diameter pipe from east to west across Albania. When archaeological finds require work to stop at a location, pipe laying continues elsewhere.

In modern Albania, the mélange of historical cultures is packed so densely they often seem to collide. The national E852 highway follows the same bank of the Shkumbin River as an ancient highway, the Via Egnatia, which was first traveled by Roman soldiers around 200 B.C. The road was modernized and maintained for centuries thereafter, and it became the main thoroughfare between Constantinople and the Adriatic, facilitating communication and trade between Rome and the eastern lands of the empire. Today, luxury Mercedes swerve between transcontinental bicyclists taking in the lush Mediterranean landscape and donkey carts hauling towering piles of forage. The route winds gently past medieval Ottoman Turkish bridges and white obelisks from the Communist era immortalizing partisan battles

fought during World War II. Scrappy tobacco fields and mounds of hay and cornstalks line the route, planted and stacked by hand, much as they have been for centuries.

This primary ancient east-west artery of the Balkan Peninsula parallels, just to the south, another major European infrastructure project, one being built today: the Trans Adriatic Pipeline. The project, known as TAP, is laying 545 miles of pipe through northern Greece and Albania and under the Adriatic Sea, connecting existing Italian and Turkish pipelines to deliver Caspian gas to Europe by 2020. Perhaps counterintuitively, the massive construction project looks set to give an enormous boost to the study and preservation of Albania's cultural heritage. During the Cold War, the hard-line Stalinist regime kept the country one of the world's

most isolated, and now this Maryland-sized country of three million is one of Europe's poorest.

TAP's resources are enormous by local standards—and could turn out to be the single greatest injection of money and know-how for archaeological exploration ever seen in Albania. The overall budget for TAP is \$5.3 billion and about a quarter of the pipeline's total length will sit in Albania. Lorenc Bejko, a prehistorian by trade who is the head of the archaeology department at Tirana University and a senior cultural heritage adviser for TAP, estimates that ordinarily the annual spending by all Albanian institutions combined on archaeological fieldwork doesn't surpass \$100,000. According to the project agreement, all management of the impact on Albania's cultural heritage—including construction monitoring, excavation, pres-

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ervation, development of management plans, scientific analysis, and even scientific publications—is controlled by Albanian government institutions and paid for by TAP. These activities are worth millions of dollars.

The odd geographical focus of the intensive TAP-funded archaeological work—a lateral route across the country 133 miles long, 124 feet wide, and typically a foot deep—coincides with the so-called right-of-way zone where the pipe will be buried. A rich variety of unrelated and unexpected ancient sites is being uncovered there: Neolithic settlements from Europe's earliest farmers, along with Roman, Byzantine, and Ottoman sites. Turan, a site used for almost 2,000 years, yielded one of the oldest known cemeteries in

Albania, dating back to 700 B.C. Ottoman cemeteries have also been found. And a picturesque hilltop settlement near the village of Peshtan, inhabited from the early Byzantine to the late Ottoman periods, has a cobbled street connecting a Turkish bath, a sixteenth-century Christian church, and several substantial houses with views of the valley below.

Empires could establish control over distant lands only when the roads were safe,” explains Bejko, traveling on the former Via Egnatia to visit project sites along the pipeline’s route. He says the road was strategically important for the postal service of the Roman Empire and expects road stations to be

court-sized dig area and the 27 researchers working there—a significant burst of archaeological energy in a country with a total of some 100 professional archaeologists. In stark contrast to most of Albania, which doesn’t have many rules, here there is structure. There are clearly demarcated boundaries, high standards, and strict procedures: hard hats, steel-toed boots, safety vests, and eye protection, since it’s an active construction site as well as an excavation.

During the summer of 2017, young archaeologists working here under the direction of Iris Pojani of the University of Tirana and lead archaeologist at Abkons, the firm contracted to provide archaeological services to TAP, were monitoring construction activities when ceramic pieces were first spotted in the soil. Suspecting that more cultural materials would be found, Pojani stopped the construction work. After six weeks of full-time excavation—a nearly unheard-of investment in archaeological study in Albania—archaeologists uncovered a Neolithic settlement, with buildings, ceramics, arrowheads, and a skeleton. “The main challenge we are now facing is keeping a balance between [economic] development and science,” says Pojani.

Reflecting on the site, Bejko says, “In other digs, you can’t explore such a large area. It’s expensive, and traditionally, the expectation is of one or several five-by-five-meter [16-by-16-feet] trenches, which is nothing compared to this one.” He adds that it is not only bigger, but also far more sophisticated than most previous excavations, with, for example, a complex dewatering system to keep it dry. Normally, Albanian archaeologists have to bail groundwater out of their work areas with buckets. “We want to make a plan of the settlement and the internal space organization of the huts,” Bejko says. “Hopes are really high here.”

He is particularly excited about the discovery of a Middle Neolithic struc-



Lorenc Bejko, senior cultural heritage adviser for TAP, shows a Middle Neolithic polished stone ax (top) and a figurine (above) dating to between 5500 and 5000 B.C. found at the large site near Korca.

found someday. “When the road is in disarray,” he says, “there is no central authority.” Shortly after, as if on cue, the TAP driver has to slow the car abruptly as a man in a green road-maintenance vest sweeps up fallen rocks using tree branches bent like a broom.

Visitors to the largest excavation along the pipeline, near the city of Korca, will be struck by the magnitude of the work. A metal structure provides shelter for the basketball



An archaeologist (top) brushes the skull of a recently discovered Neolithic skeleton near Korca. Two of the 120 skeletons (above) that were found near Turan likely date to the 1600s or 1700s. Beneath these was a burial dating to 700 B.C.

ture about 23 by 10 feet, large by the period's standards. "Usually Neolithic huts are very small and the entire family lived in a very restricted space," he says. "We don't know why this one is so much bigger. It was probably some kind of central building." Further excitement surrounds the excavation of fairly well-preserved human remains, also from the Neolithic. The skull and shoulder are inside the trench into which the pipe will be lowered. The remainder of the skeleton lies outside, so the excavation and doc-

umentation will require extending the trench. Abkons archaeologist Kiara Xhelili says, "Maybe it was some kind of ritual burial. We know the person was young because of the teeth. They are well preserved and not used very much. They didn't eat any candies."

According to Bejko, this is only the fourth Neolithic skeleton ever discovered in Albania. There were no formal cemeteries at the time, and all four people were found buried under their huts. "You live all your life in one place and when you die you are buried

in your house," he says. "This connection to your house is one of the earliest examples of *domus*, or household, in human history. This single-phase site, from the Middle to Late Neolithic, will help us understand the kinds of choices settlers made and why, and to learn about their architecture. Finding skeletons will help us understand a little more about their individual lives, not just generalizations."

One of the most interesting archaeological discoveries thus far along the route is the settlement of Turan, whose cemetery contains burials spanning some 2,000 years. Located in the middle of a windswept plain of dried mud, today it's not much to look at.

After human bones first appeared in the area, archaeologists ordered a work stoppage. They had soon uncovered around 120 skeletons tightly packed about four inches apart from each other in a small pipe trench just a foot below the surface. While the bones haven't been dated yet, archaeologists believe they are from the 1600s or 1700s, and possibly even the 1800s. But directly beneath them, they identified prehistoric burials believed to date back to 700 B.C. "We have found a number of tumulus burials from that period in this area but this is the first flat cemetery we have ever seen in the Korca Basin," says Bejko. He adds that this important discovery needs further interpretation. Burial artifacts include pottery from more cosmopolitan Greek city-states, perhaps Apollonia on the Adriatic, but also locally made pottery designed to look like "trendy" imports.

Archaeologists hope that the burials will help answer questions about who the people were and their relationship to other settlements. While this area was less socially diverse than settlements to the west where

(continued on page 61)

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 Gabriel Prieto, © Mission Archéologique Franco-
 Suisse de Saqqara, Clark Manuel Rodríguez,
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 inechina; 6—Jodi Magness; 9—Bjørn Harry
 Schønhaug; 10—Tomasz Wacko/Nia, Alama,
 imageBROKER/Alamy Stock Photo, Brian
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 nakis/Courtesy of the Hellenic Ministry of
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 15—David L. Mearns, University of Warwick;
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 (3), Juan Carlos Perez/Courtesy of the Minis-
 try of Culture and Sports, Guatemala and the
 Waka Archaeological Project; 17—© Mission
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 Jarrett A. Lobell, Courtesy Mt. Lykaion Excava-
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 48—Courtesy Mt. Lykaion Excavation and
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 Excavation and Survey Project (2); 50-51—
 Courtesy Ea Darith; 52—Courtesy Kyle
 Latinis; 52-53—Courtesy Ea Darith; 53—
 Courtesy Chan Wai Ping, Courtesy Ea Darith;
 54-55—TAP/G. Shkullaku; 56—TAP/G.
 Shkullaku; 58—TAP/G. Shkullaku(2);
 59—TAP/G. Shkullaku (2); 61—TAP/G.
 Shkullaku; 62—TAP/G. Shkullaku (2);
 64—TAP/G. Shkullaku; 68—Eve Andreski /
 Courtesy Gloucester County Council

LETTER FROM ALBANIA

(continued from page 59)

Greek colonies were already established, people here had fertile land for agriculture and engaged in trade. “These guys are much more connected to neighboring or even more distant communities. Even those who couldn’t afford imported goods were able to imitate them,” Bejko says. The cemetery was excavated and

the site, equipment, eating, mandatory safety training, and the taking of photos inside the compound. What might seem a bureaucratic headache elsewhere creates in Albania the unfamiliar yet comforting sensation of a systematic approach, of things being done the right way. After dinner, crew members enjoy one of the last warm nights of late summer by playing volleyball. Sitting at a plastic table,

law for cultural heritage, which created mandatory impact assessments and mitigation plans for construction projects in the country. Similar to the systems of funding archaeology in Italy, Germany, and the United Kingdom, Bejko says the new system creates sustainable workplaces for archaeologists and funding for preservation while ensuring that any impact on cultural heritage from construction is mitigated.



Uncovered close to Berat in southern Albania, these two Hellenistic kilns are thought to be part of an ancient production center.

studied during the spring and summer and then reburied and covered with mats so that the 40-ton pipe-lifting machines could cross over it. In the end, the pipeline’s path was adjusted to go around the site.

Back at the TAP personnel camp, construction workers and project managers live in reconfigured shipping containers that are surprisingly comfortable and quiet. TAP has strict rules about everything: access to

Bejko explains how “development-led archaeology” has transformed the field into a viable profession in Albania and provided financial stability for heritage preservation. “The only way to make archaeology relevant is to link it to economic development, in a sustainable way, and to tourism and education,” says Bejko.

While working at the culture ministry in 2007, Bejko helped draft and implement Albania’s first modern

Albania only became independent from the Ottoman Empire in 1912, and archaeology was not actively pursued as a scientific endeavor until after the Communist takeover following World War II. Bejko says the political agenda in the years from 1945 to 1991—tightly connected to building the relatively new Albanian nation—focused on shaping the scientific data to proclaim the Ilyrians the most ancient and greatest ethnic

LETTER FROM ALBANIA



The terraced site at Peshtan that was discovered in the pipeline's path is home to domestic and public buildings dating from the 6th-century A.D. to the Ottoman era.

and political entity in the region, and the earliest ancestors of the Albanians. "When the Communist system collapsed, I, along with other people of my generation, were lucky enough to be among the first to educate ourselves in the West and make a difference here," says Bejko. Under the old system, in which everything was planned and financed by the government, there was little funding or capacity for either research or preservation. Most construction in Albania was carried out without any effective oversight. One of the worst cases in the post-Communist era was the destruction of much of the ancient part of Durrës (ancient Dyrrachium) on the Adriatic. When the city was modernized, there was no mitigation. No one will ever know how much was lost.

The new approach initially met great resistance from those who grew up under the old Communist regime, including Bejko's former profes-



Well-preserved interlocking ceramic pipes believed to be from the 1600s transported water for the Ottoman hammam, or bathhouse, near Peshtan.

sors. He was accused of "privatizing" archaeology and had heated disputes with colleagues. Bejko recalls himself saying, "We are archaeologists. We are used to understanding context. So why

do you ignore the social and economic context in which we operate? Archaeology is not isolated." Eventually, his arguments won the day.

Heading west to Berat the next morning, the car passes through misty fields and valleys capped by yellow haze floating above land being burned before next year's crops

are sown. Simple village cafés, locals selling honey, peppers, and fruit, and shops displaying shiny plastic hubcaps line the road. While writing a text on his smartphone, Bejko observes wryly of emojis, “We are in danger of moving backward toward pictographic script.”

South of Berat, at a work site far from the public road, a team of three archaeologists is finishing off a study of two Hellenistic kilns. TAP’s pipes and equipment sit idly off to the side, as they have for the last three weeks. The organic material left by the two kilns looks like dark splotches in the earth the size and shape of igloos. “This is the remains of a production center, a workshop of some kind,” says Bejko. “The city was not far, so there was a demand for these kinds of products. This workshop was run by a smart local person. The clay here is very good for producing ceramics, and there is no problem finding wood for fuel. We want to understand the technology they used to fire the pottery, the amount produced, and the materials used,” he says. “Sometimes the small sites are very self-contained, but when you add them all up you get a complex landscape.”

Perhaps the most visually impressive site uncovered thus far is a steep terraced hill near the village of Peshtan. The team started work at the bottom of the hill, where the apse of a chapel was spotted during the final trenching investigation before construction began. Working their way up the slope, they uncovered a complex jumble of structures and terraces from a range of eras, cut through by zigzagging streets. The oldest buildings, at the bottom, are thought to have been built in late antiquity, around A.D. 550, while parts of the settlement were used during the Ottoman period, until the 1700s and possibly the 1800s. Workshops were found with storage jars and vessels. A Turkish hammam, or bath, has

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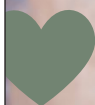
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LETTER FROM ALBANIA

much of its sophisticated plumbing to transport and heat water still intact. Some of the ceramic pipes from the 1600s look modern and industrial, much like PVC piping you might find at Home Depot today.

"We have seen terraces creating individual habitation levels," says Bejko. "The collapse of the first building served as the terrace of the second building in the later period." But while they are beautiful to look at, the terraces present special challenges for preservation because they are prone to erosion. The excavated section represents about one-quarter of the larger settlement. "We spent three months here with a large team. Ideally, if you want to expose the whole thing, it would take years," Bejko says. "Now one asks, 'Why is it necessary to expose the whole thing? It then becomes very difficult to maintain and

preserve and manage. This section is probably enough to understand the basics of the settlement."

Albania is a poor but rapidly developing country. It attracted 4.7 million tourists in 2016—a 15 percent increase over the previous year. While most come for the beaches along the relatively undeveloped coast, for low-cost holidays, and for hiking and ecotourism in the mountainous region in the north, the number of visitors to cultural sites is growing even faster. Bejko stresses the importance of archaeology as both a resource to be studied and preserved, and a driver of economic development, but only in a sustainable context. In the case of Peshtan, for example, he says, "I understand the locals wanting to attract more visitors. But we need a

stronger story to tie their visit to than just this one site."

There is rafting on the Osum River nearby, and the archaeological team wants to involve the local Nurellari winery to develop a plan for any potential public archaeological site that could help draw tourists. But there is still no public road to the site—TAP is only leasing the private land until the construction work is finished. Making Peshtan a proper tourist destination would require jumping through a lot of administrative hoops. As more and more of Albania's history is being uncovered along the TAP route, and as more and more archaeologists are being trained and working there, the country is still learning how best to tell the story of its ancient history. ■

Matthew Brunwasser is a journalist based in Belgrade, Serbia.



As pipeline materials lie nearby, archaeologists examine, label, and document finds along the pipeline's right-of-way trench near Korca.



INTERNATIONAL ARCHAEOLOGY DAY ENJOYS IMPRESSIVE GROWTH

More than 900 events were organized to celebrate International Archaeology Day (IAD) in October 2017, up from 700 in 2016. More than 500 Collaborating Organizations participated, and as reports come in to the Archaeological Institute of America (AIA), total event attendance is expected to exceed 200,000. The number of countries that host IAD events also continues to grow. More than two dozen countries actively participate in IAD, and several countries, including the Netherlands and Hungary, are organizing their own national archaeology days modeled after IAD.

To read more about 2017's IAD, go to archaeologyday.org. The AIA invites all of you to join the celebration next year. Find an event near you, organize your own event, or encourage your favorite local archaeological or historical society to organize an IAD event in 2018. While IAD is officially celebrated on the third Saturday in October, which will be October 20, 2018, Collaborating Organizations hold events throughout the month.

AIA-MOS FAIR CONTINUES TO ATTRACT THOUSANDS OF PARTICIPANTS



Attendees at the AIA-MOS Fair in Boston speak to Roman soldiers, participate in simulated digs, and use a bow drill.



On a rainy Saturday in October 2017, the AIA and the Museum of Science in Boston (MOS) celebrated IAD by welcoming more than 2,500 people to the Eleventh Annual AIA-MOS Archaeology Fair. With more than 15 presenters and activities, the fair was a one-day archaeological extravaganza that had something for people of all ages and interest levels. Attendees had a chance to meet Roman soldiers, excavate shipwrecks, grind corn, reconstruct pottery, and learn how archaeologists interpret the artifacts they find.

Archaeology fairs are attended by thousands of

people each year, and are a wonderful opportunity for the public to participate in engaging and informative activities led by professional archaeologists and educators. Fairs are also a great forum for archaeological organizations to showcase what they do. More than 90 archaeology fairs are held each year in the U.S. and around the world. These events range in size from small programs that last a few hours to large multiday events that feature more than a dozen presenters. If you are interested in organizing your own fair, the AIA has step-by-step instructions online at archaeological.org/fairs.

ARCHAEO MADNESS! AND THE WINNER IS...



Each year, as part of IAD celebrations and activities, ArchaeoMadness pits 32 archaeological sites against each other in a head-to-head competition decided by popular vote. The theme for 2017 was densely populated ancient settlements, and included Xi'an, Herculaneum, Persepolis, Timbuktu, Tikal, and Cahokia. A profile of each site includes historical background, archaeological information, and an image. The competition begins with regional battles, and winners go on to compete in a global head-to-head. The 2017 winner? Machu Picchu. Each year ArchaeoMadness offers a lighthearted way of bringing 32 ancient sites to public awareness. The true winners? Everyone who participates.



DISPATCHES

FROM THE AIA

EXCAVATE • EDUCATE • ADVOCATE

AIA TAKES THE LEAD IN ORGANIZING CONFERENCES FOR HERITAGE EDUCATORS



On October 13, 2017, the AIA and the Museum of Science in Boston hosted a conference for heritage educators in New England titled *Converging Paths and Common Goals: Archaeology, History, Science, Interpretation, and Education*. More than 30 participants from around the northeast attended. These included representatives of state and federal agencies, museums, academic organizations, and avocational groups. The main goal was to convene a variety of heritage educators from diverse organizations to discuss the issues and challenges they face in creating and

implementing outreach programs to their many audiences.

This conference is the first of its kind for the New England area and builds on a series of similar meetings that the AIA has organized at the Institute's last three annual meetings. Through this and similar meetings, the AIA is working to create a strong support network of like-minded individuals around the world to share their diverse experiences and provide advice and assistance to one another. At earlier meetings, attendees drafted a statement of ethics, encouraged the creation of a new nonprofit organization, The Heritage Educators Network (THEN), and inspired a special issue of *Advances in Archaeological Practice*. Program evaluation has also been an important topic of discussion. The conversation will continue in Boston in January at the AIA Annual Meeting, where the agenda will include writing for the public, grant proposal writing, and incorporating science, technology, engineering, and mathematics (STEM) in heritage activities and programs. For more information, contact AIA director of programs, Ben Thomas, at bthomas@archaeological.org.

AIA SPRING GRANTS

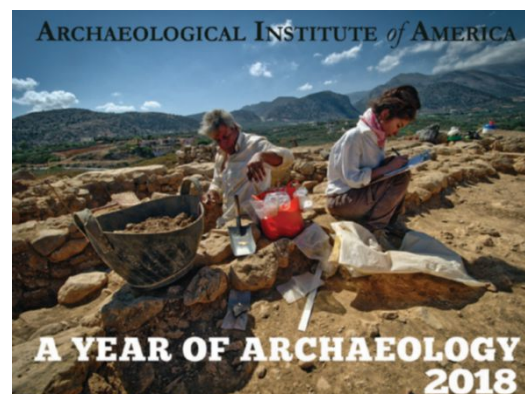
The AIA Site Preservation Program is accepting grant applications. These grants support conservation and preservation projects that are combined with outreach, education, and community engagement. Over the last eight years, the AIA has awarded grants to more than 20 projects on five continents. The grant application is a two-step process. Initial inquiries are accepted on a rolling basis. Those that are accepted will be invited to submit a full application by February 15, 2018. To read more about the program, go to archaeological.org/sitepreservation.

Undergraduate and graduate archaeology students who are interested in participating in their first field project are encouraged to apply for the Jane C. Waldbaum Archaeological Field School Scholarship. Multiple \$1,000 grants will be awarded to assist with the expenses associated with attending a field school. Applications are due on March 1, 2018.

For those pursuing a career in museum studies, the Elizabeth Bartman Museum Internship Program assists graduate students (or those who have recently completed a master's degree) with the expenses associated with participating in a museum internship either in the U.S. or abroad. The application deadline is April 1, 2018.

Visit archaeological.org/grants for information about these and other programs.

AIA 2018 CALENDAR NOW AVAILABLE



The 2018 AIA calendar is here. The calendar features pictures of archaeological sites from around the world taken by archaeology enthusiasts like you. The proceeds support AIA programs, including the Site Preservation Grant Program, and other grants and fellowships. To purchase your calendar today, go to archaeological.org.



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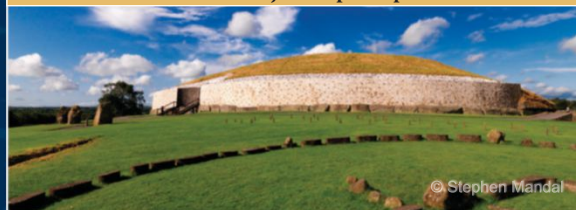
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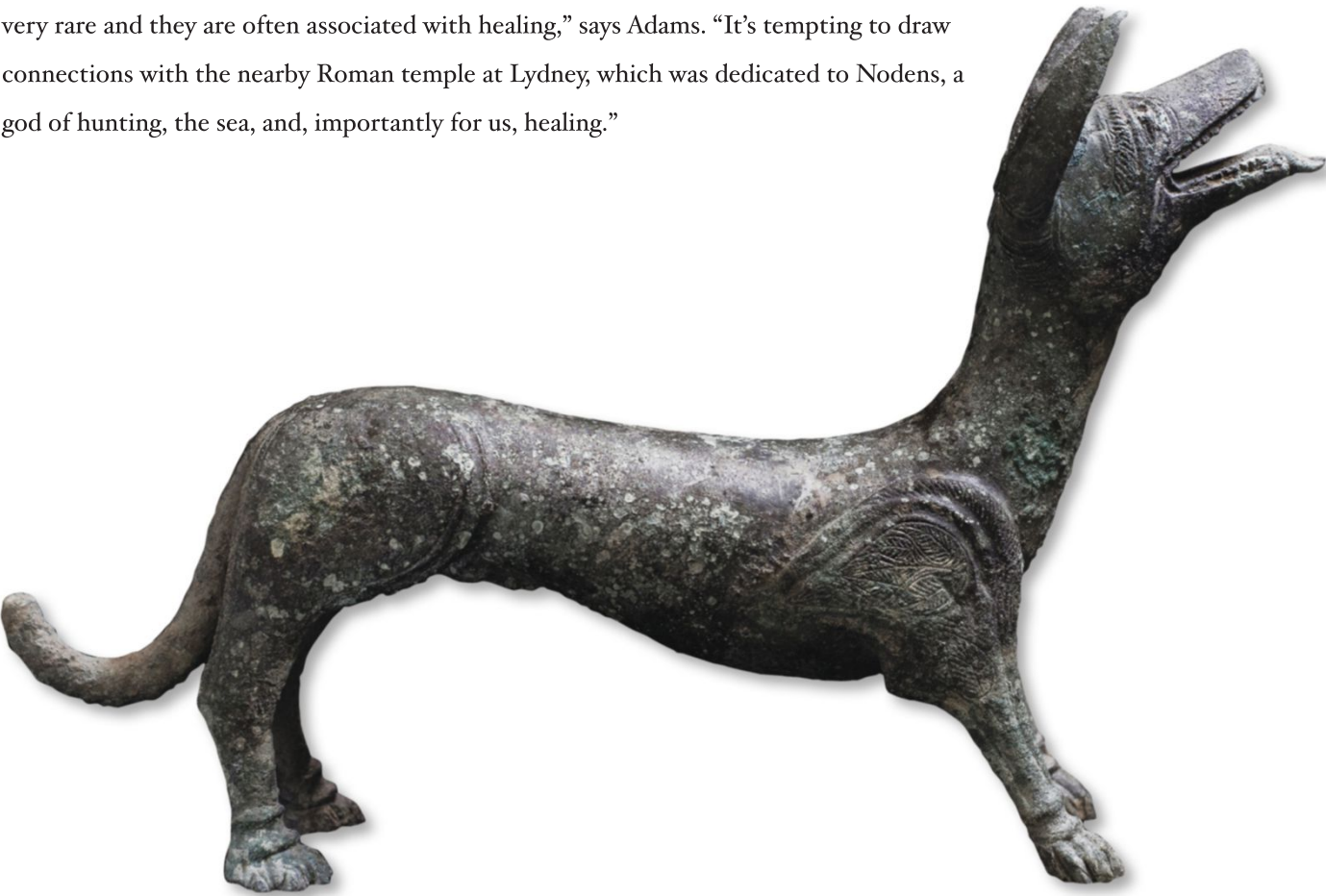
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with paleoanthropologist Ian Tattersall

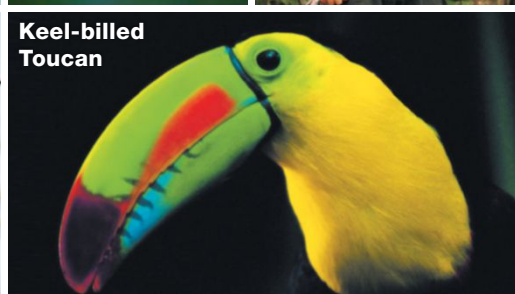
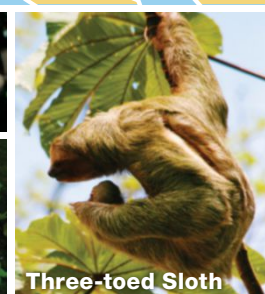
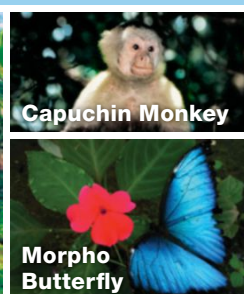
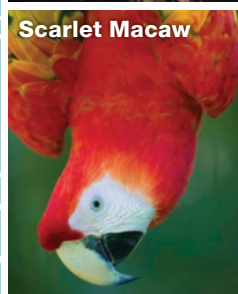
Anyone who has ever had a dog knows they are good for your health. Dogs can be trained to help people suffering from such disorders as seizures, and petting a dog can lower your blood pressure and reduce the risk of stress-related illnesses. The healing power of dogs was well known in antiquity, too.

At Epidaurus, the sanctuary dedicated to Asclepius, the ancient Greek god of medicine, sacred dogs (and snakes) are said to have licked the wounds of pilgrims who came to be cured. An inscription found at the site records that a growth on a boy’s neck was healed when one of the temple’s dogs licked it.

This finely crafted canine may also have a connection to ancient medicine. The statue was found recently in a hoard of more than 30 artifacts, all of which—with the exception of the dog—were deliberately broken, says archaeologist Kurt Adams of the Portable Antiquities Scheme. The dog is depicted with its tongue protruding—either panting, or, says Adams, perhaps more likely, licking. It’s possible that the statue was associated with a cult center not far from where the hoard was found. “Representations of licking dogs are very rare and they are often associated with healing,” says Adams. “It’s tempting to draw connections with the nearby Roman temple at Lydney, which was dedicated to Nodens, a god of hunting, the sea, and, importantly for us, healing.”

WHAT IS IT
Dog statue
CULTURE
Roman
DATE
Ca. A.D. 318–450
MATERIAL
Copper alloy
FOUND
Gloucestershire, England
DIMENSIONS
8.4 inches long, 5.2 inches tall, 1.9 inches wide





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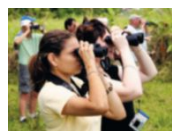
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